DIRECTOR

OPERATIONAL TEST & EVALUATION

NOTICE

This is an unclassified version of the FY 1987 Annual Report of the Director, Operational Test and Evaluation. The original, classified version of this report was submitted to the Secretary of Defense and the House and Senate Committees on Armed Services and on Appropriations on 28 February 1988, pursuant to the provisions of Section 138, Title 10, U.S. Code.

This unclassified version has been published in order to promote wider understanding of the role of operational testing in the development and acquisition of effective and affordable weapon systems.

DIRECTOR'S INTRODUCTION

This is our third Annual Report during my tenure as the first Director, Operational Test and Evaluation (DOT&E). Since I joined the office in April 1985, we have accomplished and learned much. Building upon this foundation of accomplishment and knowledge, still more must be done if test and evaluation (T&E) is to realize its full potential as a contributor to informed procurement decisions and discipline of the acquisition process.

For the most part, the body of this report is retrospective. This introduction, however, looks forward, drawing on what we have learned in nearly three years of hard work to establish an agenda for effective T&E today and tomorrow.

Simply stated, the keys to effective T&E are:

-- Adequate test resources and

-- Early and continuous operationally oriented T&E in support of the procurement decision-making process, with results independently assessed and reported to decision makers.

Without a doubt, resources adequate to do realistic and productive testing at a reasonable cost are fundamental to effective T&E. Although we have made some significant progress on this front, as outlined in Part II of this report, the simple truth is that our test resources are woefully inadequate. Too much is out of date. Too much is unnecessarily duplicative. Too much is acquired, managed and used in a parochial fashion. Too little consideration is given to T&E resource requirements in the Services' budget and program planning, and until recently, long-range T&E resource planning has been virtually nonexistent.

Largely as the result of the advocacy of this office, and with the cooperation and support of the Office of the Deputy Director, Defense Research and Engineering (Test and Evaluation) (DDDR&E(T&E)), a process of institutional change and resource planning has been set in motion. The Test and Evaluation Committee (TEC--formerly the Defense Test and Evaluation Council) has been established to provide Department of Defense (DoD)-wide oversight, guidance and advice on T&E resource and policy matters. I chair the TEC, the DDDR&E(T&E) is vice-chairman and senior officials of the Services and defense agencies such as DARPA and DNA sit as members.

As one of its top priorities, the TEC has undertaken a review of T&E budgeting in light of current and projected fiscal restraints. In a related action and with the Office of the DDDR&E(T&E) taking the lead, a TEC assessment of the role of the Office of the Secretary of Defense (OSD) in managing the Major Range and Test Facilities Base (MRTFB) has just been completed. The results of both these efforts will play a significant part in the OSD MRTFB management plan to be provided to the House Committee on Appropriations this spring (as required by the committee's report on the FY88 defense appropriations bill).

These efforts are complementary to the Test and Evaluation Management and Investment (TEMI) initiative started by this office over a year ago and now going forward under the auspices of the TEC and mandated by the Defense Guidance for FY 1990-94. The TEMI is an OSD-coordinated (through the TEC), joint-Service, long-range (15-year) planning process that projects T&E capability requirements to support adequate and realistic T&E. The ultimate result of this process will be the first ever comprehensive, well-structured national T&E investment strategy designed to support T&E for current and new-technology weapon systems. The results of the TEMI and the process it establishes will be used to develop and support T&E investment requests for the FY90-91 and subsequent defense budgets.

One of the tools used in these planning efforts and in the day-to-day test planning review and approval work of DOT&E is our new Defense Test Resource Management System (DTRMS) data base. The cornerstone element of this data base allows our staff to track threats to new weapon systems, the simulators which are able to replicate them and the availability of those simulators for planned testing. Other elements of the DTRMS permit our staff to track availability of targets, test instrumentation and other vital T&E resources, both in hand and planned (and not planned) for.

These study, planning and resource-monitoring efforts and tools make possible sound, cost-effective and comprehensive T&E resource investment based upon genuine requirements rather than "wish lists." They also significantly strengthen OSD's test planning approval authority. We now have the means to relate test-resource requirements to planning and budgeting for test-resource investment and, thus, the means to require a "match up" between the two--assuring that, when the time comes to test, the resources needed to do the job will be available.

The second key to effective T&E in support of procurement decision making and a disciplined acquisition process is early and continuous, independently conducted, assessed and reported operationally oriented T&E. I am firmly convinced that this requires a new way of thinking about T&E. In brief, this entails grouping T&E activities into two broad categories: engineering/ development, or "make-it-work" T&E, and procurement, or "does-it work?" T&E.

Engineering/development T&E is a tool used by the development community as it seeks to create technologies and weapon systems designed to meet operational requirements. As such, engineering/development T&E is a matter for oversight by the research, development and acquisition community.

Procurement T&E is conducted to determine whether or not the developers are making progress toward or, in the later stages of a program, have succeeded in meeting operational requirements. The results of such T&E must be objectively and candidly reported to decision makers throughout the lives of major and designated acquisition programs to permit informed procurement decisions. Thus, it should be the province of independent Service T&E agencies under the oversight of an OSD T&E office independent of development, acquisition and system-advocacy organizations. This office's sole business

must be 1) to assure that adequate procurement T&E can be and is conducted and 2) to assess and candidly and objectively report the results of such T&E to decision makers.

Procurement T&E carried out, reported and overseen as suggested can tell decision makers whether or not a program is making acceptable progress toward the ultimate goal of meeting the operational user's requirements. It thus gives them an objective basis for managing the commitment of funds, controlling the advancement of the program from one stage to another and so on--decisions which, quite frankly, have all too often been based on what might most charitably be called overly optimistic characterizations of program progress.

The simple truth is that this kind of "cradle to graduation" independent T&E oversight is essential. Without it, acquisition of urgently needed operationally effective and suitable weapon systems on a timely basis at reasonable cost is impossible. This is true of all major acquisition programs, but it is of life-and-death importance in so-called concurrent programs, in which development, production and T&E in some measure take place in parallel rather than serially. In such programs, significant commitments of taxpayers' dollars and tremendous investments of intellectual and skill capital must be made well before traditional T&E can be conducted. In these cases, it is vital that operationally oriented evaluations of <u>all</u> available data be made, assessed and objectively reported on a continuous basis and from the earliest possible moment to 1) maximize potential for genuine program success (a system that really works the way the user wants it to) and 2) minimize risk of failure, wasted billions and troops left empty-handed in the field.

This sort of approach to T&E and a proposed realignment of OSD T&E oversight responsibilities designed to implement it was presented to the Congress last fall in the Report of the Secretary of Defense on Test and Evaluation in the Department of Defense (25 September 1987). That report recommends vesting responsibility for procurement T&E matters in this office-DOT&E-capitalizing on our statutory independence and "Does it work like the user needs it to?" mandate.

So our T&E agenda for today and tomorrow is a relatively simple one:

-- A commitment to investment in and management of T&E resources based upon a comprehensive, long-range plan keyed to genuine resource requirements; and

-- A new approach to T&E oversight and reporting, designed to give decision makers in DoD and Congress the information they need to make informed procurement decisions and bring discipline to the acquisition and budgetary processes.

DoD policy on and a proposed organizational approach to the latter have been outlined to Congress in the Secretary's report. Some fine tuning (particularly with respect to oversight of technical compliance matters) may be in order, but the policy and basic approach are sound and need to be implemented as soon as possible.

Our proposals with respect to T&E resource investment and management are outlined in Part II of this report. They will be presented in greater detail in a supplement to this report to be published this summer and, of course, in FY90-91 T&E community budget submissions.

I welcome the opportunity to discuss this agenda with all who are interested. As I wrote in closing my introduction to last year's report, I sincerely hope that all concerned will come to share my belief that we are on the correct path. I look forward to working with Congress, the leadership of DoD and the Services and, above all, the outstanding men and women of the T&E community to bring this agenda to fruition.

John E Krings

JOHN E. KRINGS
Director

If this report helps you in any way - it is thru the outstanding efforts of the entire DOT&E Staff!

Jack Krings

CONTENTS

PART I

DOT&E ACTIVITY SUMMARY AND PROGRAM OVERSIGHT

FY87 ACTIVITY SUMMARY

During FY87, DOT&E's range and level of activity have continued to grow and with them our influence in the testing community and the acquisition process.

A major means of accomplishing this is through our review and approval of Service test and evaluation master plans (TEMPs) and operational test plans. Among those programs for which we reviewed TEMPs for comment and approval during FY87 were:

A6-E SWIP	JSTARS
ACM	LAMPS MK III
AIM-54C	LCAC
AMRAAM	LSD-41
B-1B	Peacekeeper ICBM
BLU-80B	RAM (RIM-116A)
C-17A	Small Missile ICBM
C/MH-53E	SRAM II
E-2C	SSN-21
FFG-7	Tomahawk TLAM-C
GLCM	Tomahawk TLAM-D
HARM	Tomahawk TLAM-N
	Trident II Missile

In addition, we received dozens of operational test plans in draft and final form for comment and approval, among them those for:

A6-E SWIP	F-14A
AIM-54C	F/A-18
AMRAAM	HARM
AV-8B	HARPOON
CIWS	LANTIRN
E-2C	MH-53
	TRIDENT SUBMARINE (BQQ-6)

The guidelines we have established for TEMPs and test plans, and our continuous working dialogue with Service operational test agencies (OTAs) and other OSD components concerned with T&E matters have resulted in marked improvement in the quality of TEMPs and OT plans, leading to a concomitant improvement in the quality and realism of the tests which follow them.

One of our most effective tools in our efforts to improve testing is on-site participation by the DOT&E, members of our professional staff and our expert support contractors. The vast majority of these visits involve test observation, test planning, test resource planning and test-site and range-review meetings. We are and will continue to be a highly visible "hands-on" organization.

Our continuing efforts to increase awareness in the Defense community of the importance of early, realistic and vigorous operational testing have helped bring about a positive change in attitude towards T&E within the Department. In turn, this has led to increasingly greater T&E influence on acquisition decision making. This is facilitated by the fact that the Director is a permanent and active member of both the Defense Acquisition Board (DAB) and the Defense Resources Board (DRB). We also play an active role in DAB committee reviews and Secretarial Performance Reviews (SPRs). During FY87, we were significantly involved in the decision process for such major systems as:

ACM	C-17
AMRAAM	FAAD
ASPJ	ICBM
ASAT	LHX
ATB	MSE
B-1B	RPV
	SDI

These programs under DOT&E oversight reached the beyond low-rate initial production (B-LRIP) decision point during FY87: LCAC, Lantirn Navigation Pod, ELF, and TACCS. All received favorable assessments and are now proceeding into procurement.

Perhaps the most significant organizational improvement within DOT&E occurred with the establishment of the position of Deputy Director for Resources and Administration (DDR&A). The DDR&A and his staff have responsibility for the DOT&E budgetary process, oversight of test resources matters and office administration. This new arrangement has helped streamline our operations, leading to greater efficiency and effectiveness. A significant resource management tool developed by the R&A staff is the Defense Test Resource Management System (DTRMS) discussed in the Director's Introduction to this report.

Our increased activity has resulted in a need for a modest increase in funding and resources for this office. In FY87 the DOT&E budget was $11.3 million. This was used primarily to fund contract technical and analytical support for program-specific oversight activities. With the emphasis on earlier OT&E involvement in acquisition programs and the over 150 programs under DOT&E oversight, this support is invaluable to us.

The recent DOT&E staff co-location in newly rennovated offices and our current total authorized strength of 39 (28 professional, 11 administrative), are enabling us to operate in a more efficient manner. Our increased staff has allowed us to assume additional responsibilities in several areas, including participation in the Major Automated Information System Review Council (MAISRC) process and augmented Special Access Program (SAP) oversight.

The MAISRC, chaired by the Office of the Assistant Secretary of Defense (Comptroller), is the DoD's senior management decision making body for automated information systems (AIS). AIS systems require the same level of testing before procurement to determine effectiveness and suitability as do major weapon systems, and the programs overseen by the MAISRC rival many major weapon programs in cost and scope.

Our involvement is intended to ensure: 1) AIS test and evaluation management structures support independent and objective test and evaluation activities, 2) early test planning is adequate and helps resolve planning issues, and 3) test execution and test evaluation provide meaningful assessments of program status. In FY87, DOT&E participated in the review of 16 AIS programs. We also developed an ADP testing checklist for use by AIS program managers and independent test activities.

DOT&E involvement in SAP increased dramatically in FY87. In order to carry out these duties, we have added a Staff Assistant for Special Programs. His duties involve three major activities: 1) review of SAPs to recommend DOT&E level of involvement and oversight of that involvement; 2) oversight of operational test resource availability and suitability for SAPs; and 3) assistance in formulating a test security policy for SAPs that addresses secure test resource requirements, operational needs and emerging technology security constraints. We are currently monitoring 12 SAPs and work closely with the Special Projects Office in the Office of the Under Secretary of Defense (Acquisition) to ensure comprehensive consideration for all SAPs for possible DOT&E monitoring. With the exception of the need for strict adherence to the special security controls required in SAPs, DOT&E SAP selection procedures and our detailed monitoring efforts are identical to those we apply to the "white" programs we monitor.

During FY87 an important step was taken to assure that the T&E community will have a strong and unified voice in Department affairs. This was the establishment of the Test and Evaluation Committee (TEC) to succeed the Defense Test and Evaluation Council (DTEC). The roles and activities of the TEC are discussed in the Policy and Resources Management section of this report.

A unique feature of this office is the fact that we report directly not only to the Secretary of Defense, but to the Congress as well. We have developed an effective working relationship with the Congress, which has served to enhance congressional understanding of the often complex issues associated

with DoD T&E matters. During FY87 we responded to numerous inquiries from individual members and staff as well as from the defense committees. We were called upon to provide formal and informal views and other information on such systems as Bigeye, Mk-48 ADCAP, Phalanx CWIS, ATB, B-1B, and Bradley. We were also called upon to provide information and testimony with respect to T&E budget requests for FY88-89.

The Director is our most eloquent spokesman. He is a frequently requested speaker at major Defense conferences and symposiums. In addition, he has made himself available to the media via interviews with such major news organizations as Defense Week, the New York Times, the Los Angeles Times, Newsweek, and the Wall Street Journal. These contacts have all served to increase defense community and public awareness of the importance of effective T&E to a strong national defense.

During FY87, we continued and expanded upon our efforts of previous years to increase the role and influence of independent T&E in the Department of Defense. This will ultimately result in more effective, efficient and combat-ready weapons and equipment for use by the men and women of our armed forces.

PROGRAM OVERSIGHT

This office is responsible for approving the adequacy of plans for operational test and evaluation, and for reporting to the Secretary of Defense and the Congress the operational test results for all major defense acquisition programs. For DOT&E oversight purposes, major defense acquisition programs were defined in law to mean those programs meeting the criteria for reporting under Section 2432, Title 10, U.S. Code, Selected Acquisition Reports (SARs). Currently there are about 114 such programs The law (§138(a)(2)(b)) also stipulates that the DOT&E may designate any other programs for the purpose of his oversight, review and reporting. With the addition of such "non-major" programs, the DOT&E currently is cognizant of 156 acquisition programs.

Non-major programs are selected for DOT&E oversight after careful consideration of the relative importance of the individual program and the workload of the responsible staff assistant. In selecting non-SAR systems for oversight, consideration is given to one or more of the following essential elements:

- Congress or OSD agencies have expressed a high level of interest in the program.
- Congress has directed that DOT&E assess or report on the program as a condition for progress or production.
- GAO will monitor and/or report on operational testing.
- The program requires joint or multi-Service testing (the law (§138(b)(4)) requires the DOT&E to coordinate "testing conducted jointly by more than one military department or defense agency").
- The program exceeds or has the potential to exceed the dollar threshold definition of a major program according to DoDD 5000.1, but does not appear on the current SAR list (e.g., highly classified systems).
- The program has a close relationship to or is a key component of a major program.
- The program is one in which an existing system is undergoing major modification.
- The program is in trouble or has a history of serious problems.
- The Service operational testing agencies (OTAs) have specifically requested DOT&E involvement.
- The system falls under Special Operations Forces (SOF) purview.

PROGRAMS UNDER DOT&E OVERSIGHT AS OF OCTOBER, 1987

A. Programs Meeting the Criteria of Section 2432. Title 10, U.S.C.

ARMY

AAWS-H
AAWS-M
ADDS
AFV
AH-64 (APACHE)
AHIP (OH-58D)
ASAS/ENSCE (JTF)
ATACMS
BRADLEY FVS (M2/M3)
CH-47D (CHINOOK)
COPPERHEAD
FAADS
FHTV
FMTV
HELLFIRE (AIM-141A)
LHX
M1 TANK
MLRS
MLRS-TGW
MSAM
MSE
PATRIOT
PERSHING II
RPV (AQUILA)
SADARM
SINCGARS
STINGER (ALL APPL)
TOW 2
UH-60A (BLACKHAWK)

NAVY

A-6E/F
AAAM
AIM-7M (SPARROW)
AIM-54C (PHOENIX)
AN/BSY-1 (SSN-688 SUBACS)
AN/SQQ-89 (AN/SQS-53C & AN/SQR-19 TACTAS)
ASPJ (ALQ-165)
AV-8B
BATTLESHIP REACTIVATION
CG-47 (AEGIS)
CIWS (PHALANX)
C/MH-53E
CVN 71/72/73/74/75
DDG-51
E-2C
E-6A (TACAMO)
EA-6B
F-14A/D
F/A-18
FDS
FFG-7
HARM (AGM-88A)
HARPOON
HFAJ
IMPROVED STRAT COMM
LAMPS MK III
LCAC
LHD
LSD-41
Mk-48 ADCAP
Mk-50 TORPEDO (ALWT)
NATO AAWS
NAVAL AIRSHIP
P-3C
P-3G
SEA LANCE (ASW SOW)
SH-60F (CV HELO)
SSN-21
SSN-21 (COMBAT SYSTEMS)
SSN-688
STANDARD MISSILE (SM-2)
T-45TS
TAO FLEET OILER
TOMAHAWK (BGM-109)
TRIDENT II MISSILE
TRIDENT II SUBMARINE
V-22 (JVX)
V-22 ASW VARIANT

AIR FORCE

ADI
AIM-7M (SPARROW)
AMRAAM (AIM-120A)
ATARS
ASAT
ATF (INEWS/ICNIA)
B-1B
C-5B
C-17A
CIS (MARK XV IFF)
CSRL
DMSP
DSCS III
DSP
F-15
F-16
GLCM (BGM-109G)
HARM (AGM-88A)
IIR MAVERICK(AGM-65D)
I-S/A AMPE
IUS (SPACE SHUTTLE)
JSTARS
JTIDS
KC-135R
LANTIRN
MINUTEMAN III PEN AIDS
MLS
NAVSTAR GPS/USER EQPT
OTH-B
PEACEKEEPER
PEACEKEEPER RAIL GARRISON
SFW
SMALL MISSILE (ICBM)
SRAM II
TACIT RAINBOW
TITAN IV (CELV)
TRI-TAC
WIS (WWMCCS INFO SYS)
WWABNCP

OTHER

SDI
MAISRC PROGRAMS

DCA

DDN

NSA

FSVS/STU-III

PROGRAMS UNDER DOT&E OVERSIGHT AS OF OCTOBER 1987 (cont'd)

B. Programs Designated in Accordance with Section 138, Title 10, U.S.C.

ARMY	NAVY	AIR FORCE
AFATDS	ATA	ACM
HMMWV	BIGEYE (BLU-80B)	AGM-130 (POWERED GBU-15)
M88A1	MCM	ALCM
M9 ACE	MHC	ALQ-131 JAMMER
MCS	N-ROSS	ALQ-184 JAMMER
M939A2 5-TON TRUCK	OTH-R	ATB
M109A2 155MM (HIP)	RAM (RIM-116A)	CSOC
REGENCY NET	RPVs	EF-111A (TJS)
SAW	S-3 WSIP	JTACMS
9MM PER DEF WEAPON	SUBMARINE LASER COMM	MC-130H
	SWCM	MILSTAR
	TAOC/MCE (USMC)	NASP
	VERTICAL LAUNCH ASROC	

POLICY

Two events, the submission to Congress of the Report of the Secretary of Defense on Test and Evaluation in the Department of Defense (SecDef T&E Report) and the establishment of the Test and Evaluation Committee (TEC), have been instrumental in clarifying the direction and focus of T&E policy within DoD. The SecDef T&E Report assessed and presented recommendations on testing time in the acquisition process, test policy standardization among the Services and the relationship between development test and evaluation (DT&E) and operational test and evaluation (OT&E). Currently, the TEC is addressing four sets of T&E policy issues: live-fire and joint-live fire testing, realistic testing and modeling and simulation, T&E resources and budgeting and contractor involvement in T&E. Some additional matters with significant policy implications include DOT&E use of contractor support, the introduction of operational test plan and test and evaluation master plan (TEMP) assessment guides and the evolution of standards for the definition and implementation of early OT involvement in the acquisition cycle and assessment of progress toward initial operational capability (IOC).

SecDef T&E Report

In accordance with direction in the Conference Report on the National Defense Authorization Act for FY 87 (PL 99-661), in September 1987 the Secretary of Defense provided Congress with a report reviewing T&E in the DoD. This report keyed on three specific issues identified in the Conference Report.

The first of these was the length of time currently required in the acquisition process and ways to reduce the time devoted to testing. The report concluded that T&E is not only <u>not</u> a reasonable target for time reduction in pursuit of a speedier acquisition process, but that a cutback in T&E could actually add both time and expense to the process.

The second issue was existing T&E policies of the DoD and Military Departments, and a determination of inconsistencies in fundamental testing philosophies and approaches. The report made it clear that DoD Directive 5000.3, "Test and Evaluation," sets forth a broad philosophical basis for development and operational testing and identifies specific responsibilities and methodologies for all T&E activities. The Services, in turn, have each developed regulations that implement the guidance contained in DoDD 5000.3 for their respective organizations. The Services are generally in concert with the fundamentals of DoD T&E guidance, although there are differences in terminology and approach largely caused by the different weapon system classes and operational environments with which each Service must deal.

Policy changes are reflected in updates to DoD directives and subsequent changes to Service implementing documentation. The most recent changes to DoD Directive 5000.3 include increased emphasis on early OT&E in support of more accurate and earlier assessments of operational effectiveness and suitability, the requirement for annual updates of test and evaluation master plans (TEMPS) and increased emphasis on software T&E.

The third issue identified in the Conference Report was the relationship between DT&E and OT&E and the role each plays in the acquisition process. The SecDef T&E Report outlined the current relationship of DT&E and OT&E and suggested a new approach, summarized here.

DoD Directive 5000.3 defines the relationship between DT&E and OT&E and how they support the overall objectives of the acquisition process. DT&E provides an assessment of the potential to reach technical objectives, and OT&E provides an assessment of the potential to satisfy user requirements.

While DT&E and OT&E are separate activities conducted by different test communities, the fact that they are generally complimentary leads to frequent functional and organizational interaction. This suggests the need for a new way of looking at T&E activities and roles which better serve the goal of procuring operationally effective and suitable weapon systems. Under this approach, existing T&E activities are collected under more appropriate labels reflecting a logical breakout of T&E into its functional components:

<u>Engineering T&E (ET&E)</u>--that component of T&E conducted under the control of program managers, developers and contractors to determine the engineering maturity of systems (DT&E in the narrowest sense).

<u>Technical Compliance T&E</u>--that component of T&E conducted to prove that systems and subsystems meet contractually defined technical performance specifications.

<u>Initial OT&E (IOT&E)</u>--that component of T&E, initiated at program inception, conducted to forecast operational effectiveness and suitability.

<u>Production OT&E</u>--that component of T&E required to meet all criteria established by Congress in 10 USC 138 for OT&E. Production OT&E is OT&E in the narrowest sense, the "final exam" prior to a full-production decision.

<u>Follow-On Test and Evaluation (FOT&E)</u>--that component of T&E conducted after the full-rate production decision to refine estimates of operational effectiveness and suitability, to identify remaining operational deficiencies, to clear any conditional deficiencies noted at the full-production decision, to evaluate system changes or reevaluate the system against changing operational needs.

Test and Evaluation Committee

The TEC is chartered under DoD Instruction 5000.2 to identify and resolve resource and policy issues in the T&E arena. It is chaired by the DOT&E, with the DDDR&E(T&E) serving as vice chairman. Other TEC members are the three Service T&E executives and senior officials representing JCS, USD(P), ASD(C3I), ASD(C), ASD(P&L), ASD(PO), Director PA&E, DUSD(TWP), Director DARPA, Director DNA and Director SDIO.

The TEC organizatonal meeting was held in December 1987, and committee organization, membership, mission and focus were discussed. It was established that existing T&E panels and committees will report through the TEC, and that issues already being considered under the auspices of the DoD Test and Evaluation Council (DTEC) would become responsibilities of the TEC, which has replaced the DTEC.

At the December meeting, Service representatives presented major T&E issues they thought it important for the TEC to address, and with the advice of the membership, the chairman selected the following four issues for action.

Live-fire and Joint Live-fire Testing. Survivability and lethality testing as mandated by PL 99-661 is very valuable. Of particular concern is the successful implementation of the requirement to perform such testing before proceeding beyond low-rate initial production (LRIP) in programs well along in the acquisition process, as well as an assessment of the impact of the legislation on program acquisition strategies.

Realistic Testing and Modeling and Simulation. Realism in testing in general and validation of modeling and simulation in particular are of great concern to the T&E community. The necessity for realistic verification of operational effectiveness and suitability in areas such as electronic warfare threat simulation, combined with significant budget constraints, has placed greater importance on valid and reliable modeling and simulation.

T&E Resources and Budget. Adequacy of current test resources and long-range T&E resource planning have been of significant concern to both Congress and DoD. The TEC has undertaken three resource and budget initiatives and actions:

First, the Report of the House Committee on Appropriations on the FY88 National Defense Appropriations Bill directed "OSD to take a much stronger role in managing as opposed to oversight of the Major Range and Test Facility Base (MRTFB)." The Committee called for a thorough reevaluation of facilities for the MRTFB, a more effective OSD role in the Planning Programming and Budgeting Process, and the submission of a MRTFB management plan to the Committee. This evaluation and preparation of the plan were conducted under TEC auspices, with the Office of the DDDR&E(T&E) taking the lead. The report was provided to the Committee in April.

Second, the TEC is conducting a review of T&E budgeting in light of current and projected fiscal restraints. The results of this effort were provided to the TEC in March 1988.

Third, the T&E Management and Investment (TEMI) initiative has been established to review unfunded investment requirements brought forward through the Service corporate review process. This will provide the basis for near-term as well as long-range resource planning. (The work of the TEMI and preliminary results of its efforts are discussed in the Resources Management section of this report.)

Contractor Involvement in T&E. A contractor whose system is being tested must not be allowed to influence the conduct or outcome of testing or the analysis and evaluation of test data. There is broad concern, however, that current-law provisions are too sweeping and perhaps should be limited to the final, dedicated phase of OT&E (production OT&E) preceding a full-production decision. This issue is being reviewed with an eye to developing appropriate recommendations for perfecting legislation.

Lead responsibility for each action item has been assigned, and preliminary results and progress reports were briefed to the TEC in March 1988.

T&E Symposium

A T&E symposium, jointly sponsored by DOT&E and DDDR&E(T&E) in June 1986, was judged to be an excellent forum for communication of T&E issues. A similar T&E symposium, again jointly sponsored by DOT&E and DDDR&E(T&E), is planned for early June 1988. This symposium will be conducted under the auspices of the TEC and will provide an opportunity for dialogue between and among the DT&E and OT&E communities at the Service headquarters, OSD, major DoD facility and OT&E agency levels. Topics will include those currently under consideration by the TEC and those addressed in the SecDef T&E Report.

Strategic Defense System Oversight

In November 1987, the Secretary of Defense authorized the DOT&E to undertake direction of the conduct of SDS early operational assessments and OT&E to ensure: 1) that a full systems-level architecture view is taken, 2) that separate Service efforts are integrated to provide this systems-level view, and 3) that annual early operational assessments are provided to the Defense Acquisition Board on the progress of the SDS toward an operationally effective and suitable system.

DOT&E Contractor Support

In addition to extensive on-site observation of OT by our staff assistants, we use expert contractor support, which is always provided under the direct supervision of our professional staff. The use of such contractor support is very cost efficient, and on any given day we have an average of 5 contract specialists in the field conducting OT observation activities for us under

the direction of our professional staff. These contract experts provide us with a wide range of experience and knowledge complementary to that of our professional staff. They support our staff; they do not stand in for it. We are currently developing an innovative approach to contracting for such support, which we believe will significantly enhance the effectiveness of this office and be very cost-effective.

Test Plan Assessment Guides

The development and staffing of the Test Plan Assessment Guide (TEPAG) and the Test and Evaluation Master Plan Assessment Guide (TEMPAG) constitute a major step toward standardization of test plan assessment. These guides, published as a single document, the DOT&E Staff Assistants' Assessment Guides (STAAGS), provide test plan evaluators in our office and in the Services with a standard operating procedure for test plan assessment, while providing test planners with a guide to test plan development.

Our involvement in the Major Automated Information System Review Council (MAISRC) has resulted in the development of an automated data processing (ADP) testing checklist for use by program managers and independent test activities. This document will also provide test planners with a guide to ADP test plan development, while providing our office with a standard operating procedure for ADP test plan development.

Initial Operational Capability (IOC) Standards

We are concerned with the level of understanding of IOC in many acquisition programs. Joint Chiefs of Staff Publication 1 provides this definition of the term IOC: "The first attainment of the capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics, and (sic) which is manned or operated by an adequately trained, equipped, and supported military unit or force." Continuing attention is needed to preclude misunderstandings concerning the exact military capability expected to be attained when an IOC date is specified. We are working with the Services and other OSD offices to develop standards to assess the degree of attainment of IOC so that program funding can be tied to progress toward that goal as demonstrated through testing and early operational assessments.

Early OT&E and Early Operational Assessments (EOAs)

Concurrency in weapon systems acquisition has significantly increased the need for early OT&E and EOAs. In a concurrent program, production is started while development is still under way. Having objective, independently reported OT&E data available at each critical procurement decision point in a highly concurrent program requires increased use and refinement of EOAs. The most recent revision of DoDD 5000.3, "Test and Evaluation" (March 1986), included increased emphasis on early OT&E and clarification of reporting requirements.

In July 1987, the Services briefed the chairman and vice chairman of the TEC on progress in implementing early OT&E policy. This provided the Services with a forum to exchange information on implementation of early OT while underscoring the importance placed on early OT planning by this office and the TEC. In addition, our review of all acquisition programs includes an assessment of early OT&E planning to assure that the Service operational test agencies will project the operational utility of competing system concepts and system alternatives in EOAs reported at Milestones I and II.

RESOURCE MANAGEMENT

Several factors have combined to change the cycle in which resource initiatives are brought to fruition. Consequently, we will submit a resource supplement to this report later this summer. Here, we discuss the changes to the cycle, the direction of previously reported initiatives and the status of the last cycle's funded programs.

Resource Programming Changes

With the advent of the biennial budget cycle in the DoD, there are no new T&E budget initiatives to report for FY89. Moreover, with the disapproval of virtually the entirety of the T&E portion of the FY87 supplemental appropriation request and the extended delays in enactment of FY88 appropriations, there is no progress to report on the execution of the new-start test resource initiatives--Space System Test Capabilities (SSTC) and OT&E Capabilities Improvement (OCI)--cited in last year's report.

With regard to the FY89 (off-year) budget cycle, we have found it to be a process of holding on to what has already been approved. That is, the FY89 budget cycle, referred to as an implementation review, was largely a scrub, or reduction, effort. New initiatives were few, and there were none even offered for T&E.

The late enactment of FY88 appropriations and the uncertainty of anticipated appropriation levels played havoc with all programs. Such delays and uncertainty have been particularly troublesome for such new starts as SSTC and OCI. Execution planning has essentially been put on hold. Program inputs and adjustments are even now being reviewed and assessed.

In summary, for all practical purposes, FY88 activity is just now beginning, and although we will report briefly below on the directions SSTC and OCI are heading, nothing can be said about execution.

FY87 Resource Initiatives

The DOT&E is the moving force behind a DoD-wide long-range planning and programming effort--the Test and Evaluation Management and Investment (TEMI) initiative. The TEMI began with the close of the FY88-89 budget formulation process in December 1986. It was launched under the auspices of the DoD Test and Evaluation Council (DTEC) and continues under the Test and Evaluation Committee (TEC) of the Defense Acquisition Board (the TEC has replaced the DTEC).

TEMI, as originally conceived, was intended as a comprehensive planning, programming and budgeting system. A key tenet of the approach was to separate the planning and programming functions so that needs could be considered without the constraint of fiscal limitations. That is, a planning need would be validated if it were judged necessary to provide adequate (workload or technology driven) test capability for current or projected future-technology systems. It should be understood that, for the T&E community, this two-step approach in a corporate (DoD/joint-Service) environment is a major departure. Heretofore, a need was considered valid only if it could be funded within Service fiscal guidance. Our intent in separating the steps was to create a needs baseline against which to judge the adequacy of test investment.

Despite considerable resistance in some quarters, we believe we have achieved the desired breakthrough. Although we were unable to separate planning and programming because of the reluctance of the Services to participate, we have been successful in establishing a broader T&E needs baseline. While it is not as comprehensive as a more structured process would have provided, it is comprehensive enough to provide the basis for the evaluation of the adequacy of our current test investments. The approach, process and preliminary results of TEMI will be discussed further below.

Also during FY87, the SSTC study was continued, and requirements were revalidated in light of changes to the Strategic Defense Initiative (SDI) program. The Air Force and the Army initiated their own complementary processes, which feed the corporate SSTC effort. As of this writing, the Navy has so far elected not to participate in or recognize any requirements for additional space testing capabilities. The SDI Organization has conducted its own review of space system test capability needs, using the original SSTC product as a point of departure. The continuing SSTC effort has been incorporated into the TEMI initiative. Although the results of this revalidation effort are still under review as part of the FY90-94 POM process, it is fair to say there is substantial correlation among the original SSTC baseline, the SDIO effort and the current revalidated SSTC product, including the Air Force and Army inputs. We believe we have identified a solid core of national space test resource needs.

The OT&E Capabilities Improvement program (OCI) has for all practical purposes been marking time as far as execution planning is concerned, pending congressional decisions on funding levels. However, progress has been made in the continuing effort to encourage better OT&E planning and to collect that information in a data base.

Test and Evaluation Management and Investment Initiative

The scope of the TEMI initiative originally included investment (resource planning and programming) and management elements. However, due to the reluctance of the Air Force and the Navy to participate and the resultant delays, management initatives--including reviews of the current uniform (reimbursable) T&E funding policy, the Major Range and Test Facility Base (MRTFB) structure (geographical vs. functional), centers of test expertise and T&E program element proliferation--had to be deferred.

Nevertheless, the primary effort--validation of a T&E needs baseline--is underway. The three Services brought their needs and proposed (priced) solutions to a workshop in Albuquerque, New Mexico, the first week of February 1988. The importance of this as a breakthrough in DoD corporate management style is significant indeed. Briefly, the Services presented over 420 individual needs packages with priced solutions. These were reviewed by seven functional panels composed of Service technical experts and chaired by more senior Service technical experts, including center and range technical directors. These joint Service panels culled the inputs down to just over 230 packages. The review also reduced the total original estimated cost of the proposed solutions from almost $15 billion over the FY88-94 period to approximately $11.6 billion over the same period.

The panels were charged with revalidating needs and solutions which had already been through Service validation processes, and then to categorize the output into four groups: Category A, "show stoppers," must haves; Category B, risk reducers; Category C, efficiency, improvements, "nice-to-haves"; Category D, open questions which cannot be rated. At this writing, the Category A cost estimate is approximately $9 billion, with the major drivers being in the space test area, hypersonics and sensor ground test needs, electronic combat simulation and open-air facilities and targets. A substantial sustaining (upkeep and improvement of current capabilities) investment need was also identified.

The review process is still under way, and final validation of needs and any funding for them will ultimately be decided in the FY90-94 POM review process. However, it is clear that the "hidden" T&E resources problem is real and hidden no longer. DoD is beginning to come to grips with it in a corporate fashion for the first time. And it is being recognized that in a period of fiscal restraint, T&E resource investment is a most prudent course, for an investment in adequate and more realistic testing is, in fact, an investment in more effective weapons systems.

Space System Test Capabilities

As has already been noted, the long delay in enacting FY88 appropriations has disrupted program planning and execution. This has complicated an already difficult situation. To revisit briefly last year's OSD budget decision, funding was approved for the SSTC initiative for FY88-89, and funding responsibility was assigned as shown below:

	FY88	FY89	FY90*	FY91*	FY92*
		($ in millions)			
SSTC	80	176	333	425	476
(SDIO Assigned	48	160)			
(NASP Assigned	30	11)			
(DDDR&E(T&E)	2	5)			

*Only FY88-89 funding was approved, with the understanding that FY90-94 would be revisited in the FY90-94 POM review.

At this writing, the National Aerospace Plane (NASP) program (Air Force) continues to wage a delaying action. After our initial reclama of the above funding direction, we have been in various stages of negotiation with the Air Force to obtain funding. The SDIO committed to provide funding for the SSTC. However, they did not accept $48 million as being necessarily the correct figure. Now, with an approximately 30 percent reduction in the FY88 SDI program, the $48 million "bill" for SSTC has become a $9 million offer, an 81 percent reduction.

We are still negotiating with both offices, and will not know final funding availability until mid-year. Since the TEMI and ongoing SSTC initiative have substantially revalidated the original SSTC baseline, we will seek restoration of most of the original funding authority. e whole experience has served to confirm that levying acquisition programs to fund T&E investments does not work, particularly in the execution year.

OT&E Capability Improvement

During FY87 the Services formulated OT&E requirements, which were loaded into the DOT&E Defense Test Resource Management System (DTRMS). This information was part of the input to the TEMI initiative, and constantly updated, it will form the information base for future OT&E investment decisions. On the program execution front, as it became apparent that some FY88 funding would be appropriated ($59 million vice $93 million requested), a tri-Service steering group was formed to restructure the program. Since we had to wait until the end of the first quarter of FY88 for enactment of the FY88 appropriation, the restructured program architecture is still in development. Nevertheless, our focus remains a transportable simulated air-land battlefield OT&E capability.

Other Initiatives

Phase II of the targets study discussed in last year's report is in its final stages. It appears to confirm the deficiencies identified in phase I: fixed wing, helicopter, multiple-target control systems, management and inadequate long-range planning. The TEMI initiative may solve a number of these problems or, at least, provide a significant step toward their solution. Targets constituted one of the primary investment drivers in the Service TEMI submissions. We expect investment levels will be determined in the process of reviewing the TEMI product.

Test and evaluation master plan (TEMP) resource summaries, collected by this office for the first time last year, will be updated immediately after submission of Service POMs in April. This will allow program offices and test activities time to assess POM resource adjustments and reflect them in TEMP resource summaries. The submissions will then be compared to those of last year for the same programs to determine trends and any significant test program changes resulting from resource adjustments.

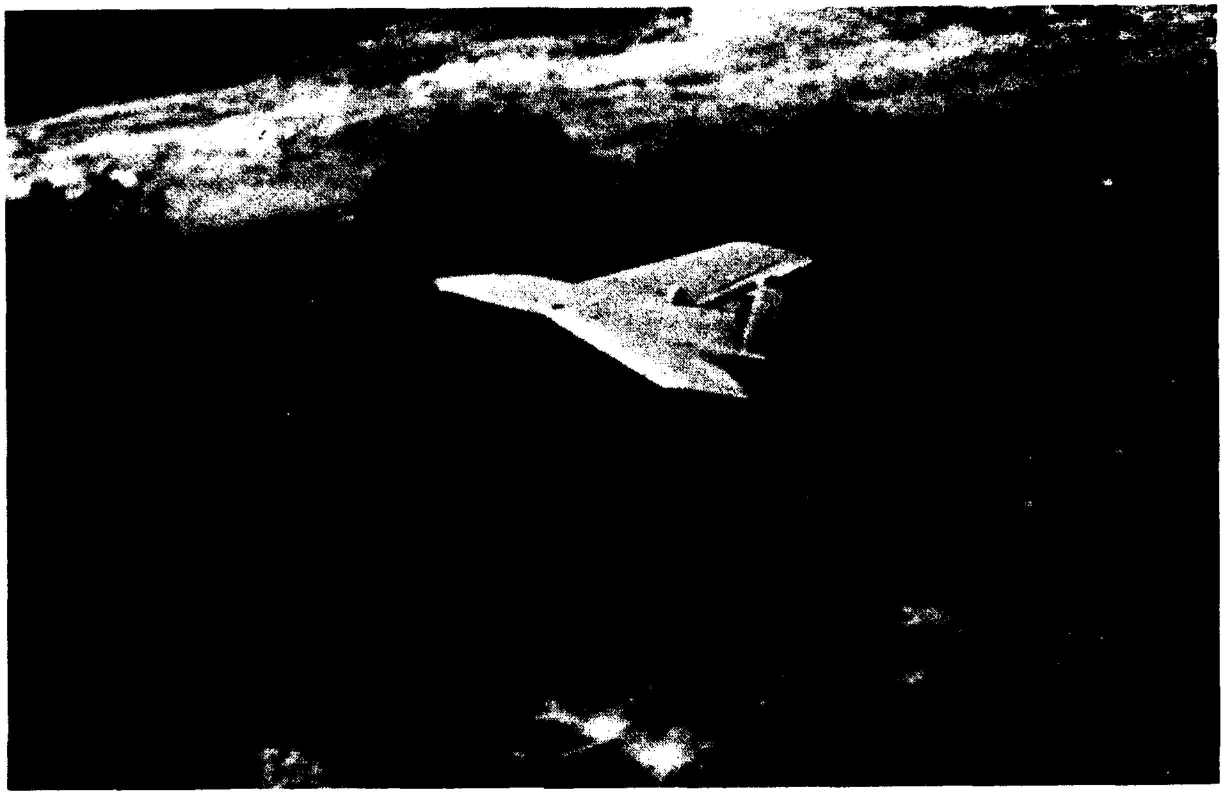
Summary

As reported above, resource and management initiatives are continuing despite the destabilizing effects of the congressional budget process. Progress on continuing initiatives is not at a reportable end point because of the FY88 budget delays. In addition, in this off-year of the biennial budget process there is little to report in terms of new initiatives. The one major breakthrough mentioned here--TEMI--has the potential to pave the way for a true corporate DoD T&E resource planning process. Its goal is to recognize test capabilities as being national assets and to focus investment resources on those items that will contribute to an adequate and realistic T&E capability.

PART III

ARMY OT&E

AQUILA-RPV



SYSTEM DESCRIPTION

The Aquila is a remotely piloted target acquisition, designation and reconnaissance system (TADARS) operated by a 94-man battery. The battery's equipment consists of 10 air vehicles (AVs), two hydraulic launch vehicles, two net recovery vehicles, 5 ground control stations (GCS) 5 remote ground terminals (RGTs), two air vehicle handlers and mobile maintenance support facilities, all of which are mounted on 5-ton trucks. The AV weighs 265 pounds, has a 26 horsepower pusher propeller power plant and carries either a television or infrared camera with coaxial laser range finder/designator. The modular integrated command and navigation system (MICNS) provides a secure data link which transmits control commands to the AV and receives the AV flight data and sensory imagery in real time. This data is relayed through the remote ground terminal to the ground control station using fiber optic cable. The system is mobile, providing for up to three AVs to be operating simultaneously on three-hour missions, which may be up to 45 kilometers from the RGTs. Aquila is intended to search for targets and give target locations with sufficient accuracy for Copperhead rounds to be guided to targets by the AV's laser designator, and for adjustment of conventional artillery fire. Control software is designed so that the actual piloting of the AV is not required of the operator in the GCS. Infrared sensors guide

the AV into the recovery net. The materials of the AV and its flight programming capabilities are intended to minimize its vulnerability to ground based air defenses.

BACKGROUND

In FY75, a request for proposal was issued to industry for a complete remotely piloted vehicle (RPV) system. Aquila force development test and experimentation (FDTE) was conducted at Fort Huachuca, Arizona, during FY78. A required operational capability for a target acquisition/designation system was approved by the Department of the Army in May 1978. Supporting technology efforts (e.g., an antijam data link and survivability testing) were undertaken. Development testing in the spring of 1985 showed that such problems as AV recovery, AV handoff from one GCS to another and frequent AV crashes had been substantially overcome. Training of troops for the operational testing (OT II) of Aquila was conducted at Fort Sill, Oklahoma, during summer 1986. The operational test of the system began in November 1986 using only the TV sensor payload. Operational testing of the forward looking infrared (FLIR) payload was deferred because of time slippages and associated funding difficulties. DOT&E reviewed and commented on the Army Operational Test and Evaluation Agency (OTEA) test design plan (TDP) and the OTEA independent evaluation plan (IEP). DOT&E had an average of 2-3 representatives on site during the operational test, and DOT&E representatives spent several days observing the training of the test battery at Fort Sill prior to the operational test.

OT&E ISSUES

Three OT&E issues were focused upon in OT II conducted at Fort Hood from November 1986 to March 1987: (1) Aquila's ability to be tactically launched on command, fly a mission and be recovered in condition to fly again; (2) its ability to detect, recognize and locate tactical target arrays; and (3) its ability to adjust conventional artillery fire and designate for the Copperhead round. Other OT&E issues were survivability, reliability, availability and maintainability (RAM), training and human factors. These were addressed only to the extent that they affected the ability of Aquila to meet the criteria on the three principal issues.

OT&E ASSESSMENT

The Aquila frequently was unable to be launched within an hour of mission command. This was primarily due to a need for better diagnostic procedures for determining the exact causes of failure to launch on command. Once launched, the AV was adequately able to complete its flight and be recovered (143 launches, 133 net recoveries, 9 parachute recoveries and 1 crash).

The AV detected fewer than one-quarter of the target arrays that were presented. DOT&E's analysis of the reasons for the detection problems showed that the difficulties lay in the technical mission planning of the Aquila flights. In general, flight altitudes were at 1000 meters, and the Aquila was used to search areas from circular flight positions 1000 meters or more from the edge of the area being searched. The result was that much of the time the targets were shielded from the sensors by either terrain or foliage or, if in line of sight, were beyond the resolution limits of the sensor. When these conditions did not exist and the sensor's field of view included the target arrays, the detection rate was adequate.

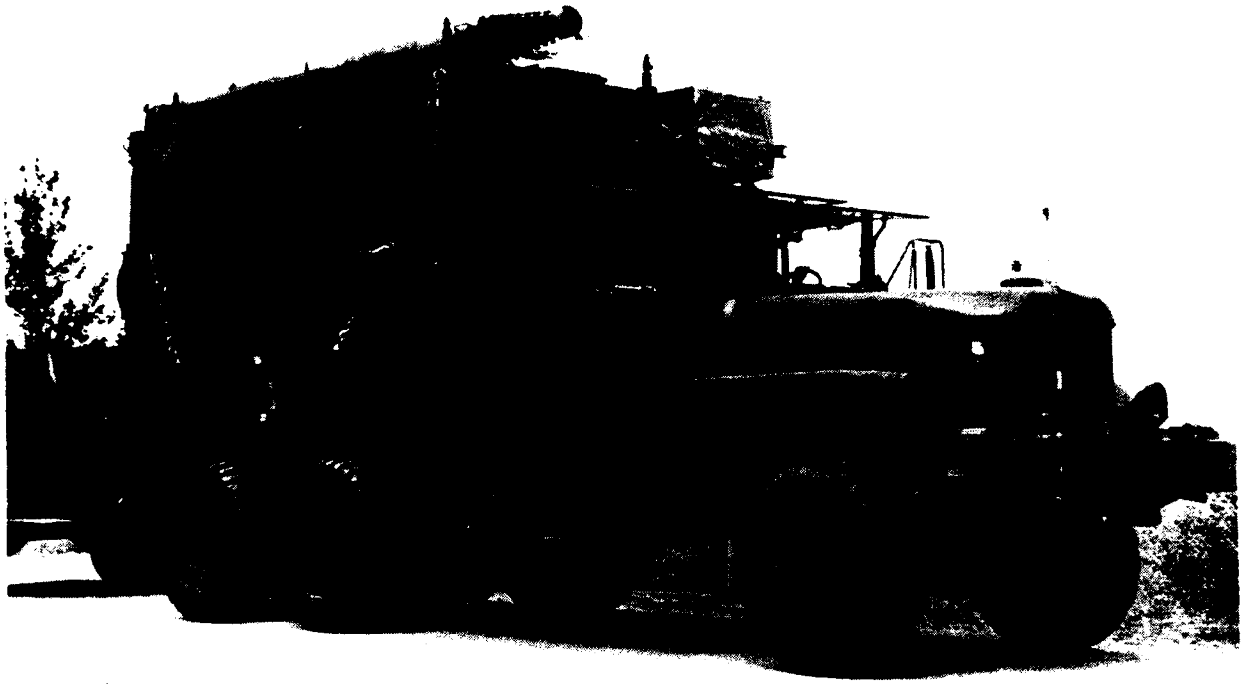
The Army executed an experiment in November/December 1987 with a manned aircraft carrying the AV to determine the effect on detection of higher flight altitudes, preprogrammed search routines and the addition of an offficer to the GCS crew. Results will be analyzed by this office as they become available.

The Aquila was quite successful in using its laser designator to guide Copperhead rounds to targets under tactical conditions. While the Army criteria for adjustment of conventional artillery fire were not fully met, the Aquila system performed better under operational test conditions than ground based systems in previous operational tests. An average of 2.7 flights per day was obtained during the operational test, which was restriced to daylight hours because of the unavailability of the FLIR sensor payload, which is tentatively scheduled for operational testing in FY89.

SUMMARY

The Aquila procurement decision is being deferred by the Army pending resolution of the target detection and other problems noted above. DOT&E analysis of the data from OT II (particularly with respect to the system's detection recognition and location capabilities) is continuing.

ARMY ALL SOURCE ANALYSIS SYSTEM (ASAS)
AND
AIR FORCE ENEMY SITUATION CORRELATION ELEMENT (ENSCE)
OF THE
JOINT TACTICAL FUSION PROGRAM (JTFP)



SYSTEM DESCRIPTION

The Joint Tactical Fusion Program (JTFP) is a joint Army and Air Force program to develop an automated system to correlate and analyze high volumes of time-sensitive intelligence data and disseminate the results to tactical battlefield commanders. The major components of this program are the Army's All Source Analysis System (ASAS) and the Air Force's Enemy Situation Correlation Element (ENSCE). The ASAS and ENSCE developments are funded in the JTFP full-scale development program elements, with Army as the executive agent.

ASAS is the control node for the intelligence electronic warefare (IEW) portion of the Army Command and Control System (ACCS) and is the focal point for exchange of information between ACCS and other Services, allied forces, and intelligence resources. ENSCE is the focal point for exchange of information between the Air Force Tactical Air Control Center (TACC)/Tactical Air Control System (TACS) and other Services, Allied Forces, and theater and national intelligence resources. ASAS/ENSCE manages tasking for intelligence collection resources and is an intelligence processing and target nomination

system operating at levels up to Top Secret/Sensitive Compartmented Information (TS/SCI). A multi-level security information processing capability is required.

ASAS/ENSCE is comprised of hardware modules, software packages, workstations, and mobile tactical shelters. The hardware modules will be interconnected by a local area network (LAN). Four types of hardware modules include: (1) the ASAS/ENSCE Interface Module (AIM) to interface ASAS and ENSCE and process intelligence data; (2) the Communication Processor and Interface (CPI) module, which interfaces data processing modules with all other intelligence sources through the area communications network; (3) the forward sensor interface and control (FSIC) module, which relays data from ground-based intelligence sources in forward areas to the division data processing modules and extracts perishable combat information from the message flow for brigade commanders; and (4) the portable ASAS/ENSCE work station, which is the primary user interface with the system.

Software is being developed with time-phased releases. The first release (Release 1) is to provide the basic system and communications software to operationally support an Army tactical operations center (TOC). The second release is to build on Release 1 and provide operational support to the Army TOC, and the Army combat electronic warfare intelligence (CEWI) operations, and the Air Force Tactical Air Control Center (TACC). Because of differences in the deployment of hardware for the Army and Air Force which affect the software build process, the second software release is being designated as Release 2 for the Army and Release 3 for the Air Force. Other releases have been deferred to a preplanned product improvement (P3I) phase.

A tactical simulation (TACSIM) will provide a capability to drive the system for training and testing activities.

A limited capability configuration (LCC) comprised of AIM modules, FSIC modules, and PAWS, is now being developed for fielding before completion of full system development. This LCC system will provide the hardware for field testing the first increment of ASAS/ENSCE software.

BACKGROUND

In 1980, the House Committee on Appropriations and the House Permanent Select Committee on Intelligence directed DoD to consolidate separate Army and Air Force efforts to automate intelligence fusion systems. In turn, DoD established the Joint Tactical Fusion Program Management Office (JTFPMO) to develop a single automated system. A letter of instruction (LOI) and joint program charter were signed by the secretaries of the Air Force and Army in 1982, with the Army as executive agent. A Joint Oversight Group (JOG),

chaired by the vice chief of staff of the Army, provides guidance and exercises ASARC/AFSARC authority. In 1984, Congress expressed concerns about the cost of the program and the need for smaller automated intelligence analysis systems for rapid deployment units. Congressional guidance was given in December 1985 to emphasize repackaging and downsizing of the hardware to fit Army light division S-250 (7-foot) shelters. Development of larger (12-foot) S-280 sheltered modules which had been downsized from the International Standards Organization (ISO) 20-foot shelters was to be deferred until FY86.

Test and evaluation of ASAS/ENSCE has included an AIM brassboard evaluation at the 9th Infantry Division (Motorized) in March 1985, field trial of pre-prototype AIM(6)s and prototype FSICs at Fort Hood, Texas, in November and December 1986, and a PAWS field evaluation at the 2nd Armor Division during June 1987.

OT&E ISSUES

The ASAS/ENSCE program is proceeding without an approved test and evaluation master plan (TEMP) or operational test (OT) plan. A draft TEMP dated 1 April 1987 is still awaiting Service approval and forwarding to OSD. ASAS/ENSCE is defined by the Army as an evolving program and system that cannot be fully measured against requirements until stable mature software has been verified, potentially after system initial operational capability (IOC) is declared. The Army also refers to the hardware modules as non-developmental items (NDIs). A limited capability configuration (LCC) comprised of AIM and FSIC modules and PAWS is being planned for procurement and fielding before completion of full system development and testing. The Army's Operational Test and Evaluation agency (OTEA) has concluded from field trials on the AIM and FSIC that more time must be allowed for developmental testing to verify software maturity and force development test and experimentation (FDT&E) must be conducted to refine concepts and doctrine. Operational and security requirements will require security accreditation by the Defense Intelligence Agency (DIA). We expect these issues and others critical to operational effectiveness and suitability to be resolved in the TEMP and OT plan approval process.

OT&E ACTIVITY

OTEA conducted field trials of AIM(6) and FSIC modules from 17 November through 19 December 1986 at Fort Hood, Texas. These were early user investigations of system operational concepts and were designed to aide development of operational test methodology, instrumentation and resources requirements for future testing of ASAS/ENSCE. OTEA issued a test report on these field trials in February 1987 and followed with a 25 June 1987 independent operational assessment (IOA) report. The IOA report was forwarded to the defense committees of Congress by the Army on 19 August 1987. Our office did not observe the field trials.

OT&E ASSESSMENT

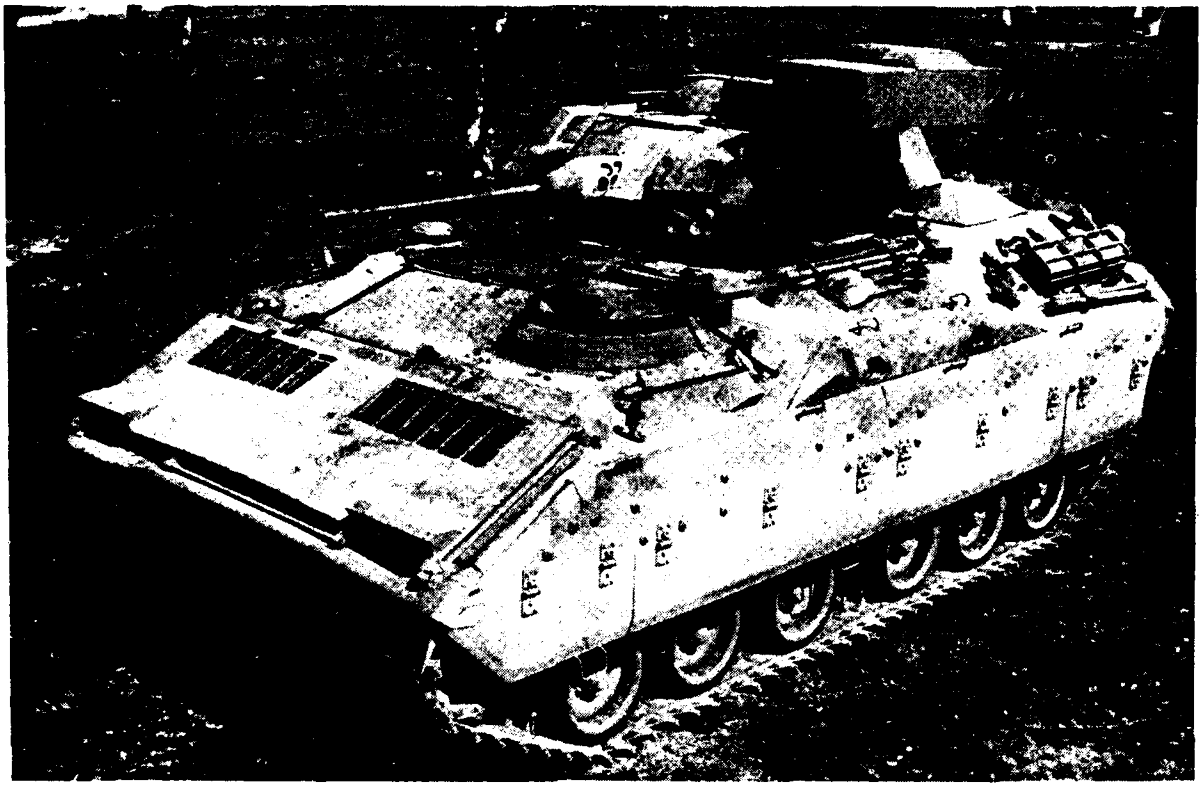
OTEA assessed results of the AIM(6) and FISC field trials in its IOA report dated 25 June 1987. OTEA's conclusions included these findings: Performance was as expected for this stage of development, FISC modules demonstrated significant capability to relay information to nodes and extract information from message traffic, ASAS organizational and operational concepts require refinement, and the requirement document needs clarification. System survivability/vulnerability was identified as an issue. Better methods and more time are required to verify software maturity and fix hardware faults. Test data collection and processing must be automated in future evaluations.

Our assessment is that test planning has not been adequate to provide test results of sufficient quality to permit informed procurement decisions.

SUMMARY

The TEMP submission is seriously delinquent. A TEMP and an OT plan approved by OSD are required before testing considered adequate to support procurement decisions may be conducted.

BRADLEY FIGHTING VEHICLE SYSTEM (M2/M3)



SYSTEM DESCRIPTION

The Bradley Fighting Vehicle System (BFVS) includes the M2 Bradley Infantry Fighting Vehicle (BIFV) and the M3 Bradley Cavalry Fighting Vehicle (BCFV). Both the BIFV and BCFV are armored, full-tracked fighting vehicles which provide cross country mobility, mounted firepower, communications and small arms and artillery fragmentation protection for their crews and infantry/artillery scout squads. The two-man turret of the Bradley has a stabilized, dual-fed, 25mm automatic cannon; a two tube TOW ATGM launcher with sight; and a 7.62mm coaxil machine gun. The BIFV carries a six man infantry squad; the BCFV carries a three man scout squad. Both have a crew of three (commander, gunner, and driver). Except for minor modifications for squad size, equipment and stowed ammunition, the vehicles are identical. The Block II (high survivability) modifications to the BFVS are designed to reduce the probability of catastrophic vehicle loss and to provide increased protection for the crew/squad. Some major Block II modifications are: reactive and applique armor, interior spall liners, revised fuel storage and distribution system, a revised ammunition stowage plan and a revised fire suppression system.

BACKGROUND

The Bradley Block II modification program was initiated in May 1985 to meet a requirement to have an improved capability to meet the 1990s projected threat--particularly hand-held antiarmor weapons. DOT&E requested that the Army provide adequate data on the range, angle of attack, posture and frequency of attack of the BFVS under operational conditions. In response, the Army proposed that these data be obtained from National Training Center (NTC) exercises. DOT&E staff visited the NTC and determined that this was not a source for useful information of the type required. We insisted that there be an adequate operational test to derive the required information.

In January 1987 the Army began an overall operational assessment (OA) program that covered both operational and technical testing. Once planning was underway, this office was instrumental in determining the location of the Combat Vehicle-Combat Performance Operational Assessment (CV-CPOA) operational test, the dimensions and nature of the test, and the equipment to be instrumented. DOT&E pressed for the inclusion of armed, threat-representative helicopters in the test, but reluctantly had to accept that this was not possible due to time and instrumentation constraints.

In March 1987 user testing of the vehicles' fightability was conducted by the Army Infantry Board. In March-April 1987, live fire vulnerability testing was conducted by the Army Ballistic Research Laboratory. DOT&E required that the results of this live fire testing be incorporated with the aimpoint and angular distributions that would result from the CV-CPOA, and the CV-CPOA analysis plan and its execution were also subject to early and continuous monitoring by this office. Technical testing of other capabilities such as swimming and transportability were also conducted, and the results became part of the overall assessment.

The CV-CPOA, conducted March through May 1987, at Fort Hood, Texas, tested BFVS battlefield operational survivability and was a major, two-phase, instrumented, free play, force-on-force operational test. Phase 1 tested battalion/company-level operations to assess the overall survivability of the basic Bradley. Phase 2 tested platoon-level operations with the four versions of the Block II vehicles. The Director witnessed and representatives of DOT&E observed the CV-CPOA trials.

OT&E ISSUES

The key issue in the operational assessment was whether the Block II modifications provided an increase in vehicle and personnel survivability. Supporting issues evaluated were whether these modifications degrade the performance of combat-mission-essential functions and/or degrade the logistic supportability and transportability of the vehicle.

OT&E ASSESSMENT

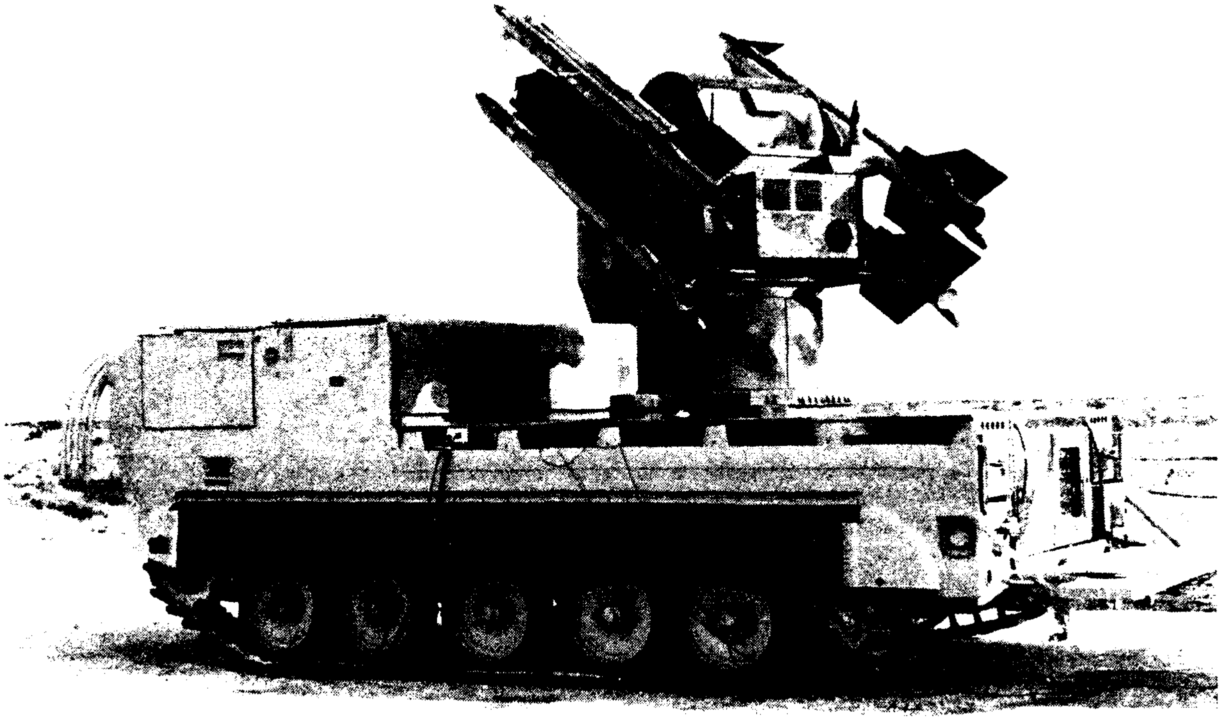
Operational testing in FY87 included Infantry Board user testing and the CV-CPOA. These test accumulated 5,876 KM under operational conditions. The user test evaluated a broad range of crew, squad, and vehicle tasks. The CV-CPOA was a significant undertaking to evaluate the mission effectiveness and survivability of the Bradley in a combined arms operational environment. The final report on the independent evaluation of the Bradley Block II (high survivability) Modifications was published in September 1987. The CV-CPOA generated the first set of data on armored-vehicle combat aimpoints and range and frequency of engagements since world War II.

The testing and evaluation conducted were comprehensive and provided sufficient objective information to make a decision on the Block II program. It was determined that the Block II modifications (1) do improve the survivability of the vehicle and its crew/squad, (2) do not degrade mission performance, and (3) will cause logistic repercussions, particularly in regard to storage and other requirements associated with reactive armor. It was also determined that hand-held anti-armor weapons represent a much less significant threat than the 30mm automatic cannon. Further, it was observed that proper tactical employment of the Bradley and other combined arms capabilities may have a greater effect on survivability than do technological modifications.

SUMMARY

The Army's comprehensive operational assessment combined the results from many operational and technical testing sources and evaluated the issues within the framework of one of the largest instrumented free play tests conducted to date. With DOT&E support, the Army is continuing to examine the results of the CV-CPOA from the standpoints of other weapons systems and the total combined arms environment.

CHAPARRAL ROSETTE SCAN SEEKER



SYSTEM DESCRIPTION

The Rosette Scan Seeker (RSS) is an advanced infrared seeker that is applied to the existing Chaparral missile. Chaparral missiles are light-weight, supersonic, passive-homing missiles which use infrared (IR) radiation from the target for tracking.

BACKGROUND

The Chaparral RSS is a preplanned product improvement to the Chaparral system. As such, it would not necessarily be subjected to oversight by this office. However, as the Army was conducting the planned tests in 1986, numerous problems occured which caused delays and raised concerns among OSD staff as to the effectiveness and suitability of the RSS Seeker. Accordingly, this program was added to the DOT&E oversight list after testing had commenced. Therefore, the test plan was not approved by this office. However, we did observe some of the testing and are throughly reviewing the Army's test data.

OT&E ISSUES

There were five test issues addressed during the operational test: (1) Does the Chaparral RSS system accomplish its air defense mission in an infrared countermeasure (IRCM) environment? (2) Is the Chaparral RSS missile maintainable in an operational environment? (3) Is the Chaparral RSS missile reliable in an operational environment? (4) What are the training differences, if any, between the current Chaparral and the Chaparral RSS (5) Can the Chaparral RSS guidance section logic be reprogrammed at the intermediate general support (IGS) level?

OT&E ACTIVITY

The Chaparral RSS prototype qualification test government (PQT-G) was conducted at White Sands Missile Range, New Mexico, during the period February 1986-1987. At the close of the fiscal year, the Army Operational Test and Evaluation Agency (OTEA) had not completed its report nor had we completed our analysis. Our beyond low-rate initial production (B-LRIP) report to the Secretary of Defense and the Committees on Appropriations and Armed Services of the House and Senate will be submitted during CY88.

FORWARD AREA AIR DEFENSE SYSTEM (FAADS)

SYSTEM DESCRIPTION

The air threat to forward area U.S. combat elements consists of enemy helicopters and fixed-wing aircraft. Previous testing with the DIVAD (Sgt. York) system has made clear that the threat--particularly that from hovering helicopters using standoff missile systems--will be significant and difficult to counter. To accomplish this, the Army Forward Area Air Defense (FAAD) system has been proposed. FAAD is an aggregation of five elements: a line-of-sight forward heavy system (LOS-F-H), a non-line of sight system using a fiber-optic guided missile system (FOG-M), the pedestal mounted stinger (PMS), a command, control and intelligence system (C^2I), and a combined arms initiative (CAI) to improve tank and artillery counter-air capability and to develop an air-to-air capability.

OT&E ACTIVITY

The Army completed a series of tests at Fort Bliss, Texas, to assess the three proposed candidates for the PMS, and at the end of FY87 was nearing completion of a series of tests at White Sands Missile Range, New Mexico, to assess the four proposed candidates for the LOS-F-H. Each of these systems is reported on separately below.

LINE-OF-SIGHT-FORWARD-HEAVY (LOS-F-H)
AIR DEFENSE ANTI-TANK SYSTEM (ADATS)

SYSTEM DESCRIPTION

The Air Defense Anti-Tank System (ADATS) is a highly mobile and transportable air defense weapon system that mounts eight-laser-beam riding missiles on a Bradley Fighting Vehicle (M3A1). The System also includes a search radar, television optics, a forward looking infrared receiver (FLIR), and a laser range finder. An ADATS crew consists of three men: the fire-unit commander, the gunner and the driver. ADATS is an international system, with major components being supplied by contractors from the United States, Canada, Switzerland and Italy.

BACKGROUND

The Army has recently completed a series of tests at White Sands Missile Range, New Mexico, designed to help assess potential candidates for the LOS-F-H system. Four contractor teams had proposed systems--ADATS, Liberty, Paladin, and Rapier--based on currently available systems or prototypes, to fulfill the LOS-F-H role. The tests allowed the Army to assess the capability currently achievable by the candidate systems. Those assessments, together with an evaluation of costs and proposed improvements, formed the basis for the Army's announced selection of the ADATS as the LOS-F-H choice. This report summarizes this office's review of what is known and unknown about the capabilities of ADATS as a result of the tests.

ADATS is expected to provide low-altitude air defense to the forward division area, especially the forward maneuvering units such as Ml Abrams tanks and Bradley Fighting Vehicles. In addition, ADATS must maneuver, fight and survive alongside the forward maneuvering units. The primary threat for ADATS to handle will be standoff hovering helicopters. ADATS will be deployed in heavy divisions, separate heavy brigades (armored and mechanized infantry) and armored cavalry regiments.

OT&E ISSUES

The Army initially proposed that the LOS-F-H candidate evaluation be a data gathering exercise and thus contended that approval of the test plan by the DOT&E was *not necessary. Since the Army characterized* this as a test of "non-development items" and acknowledged that the test results would be used to support a procurement action, we intervened and approved the test plan after requiring that it be revised to address several issues adequately . Issues that we insisted be addressed included use of a true hovering helicopter, increasing firing intercept ranges to 6.0 kilometers, elimination of all benign trials except one, increased levels of ECM and provision of obscurants on at least one target.

Given the limited test assets and short period of time to complete the selection process, the test had recognized limitations. Future testing of the ADATS must address these limitations:

Missile Performance. ADATS should launch and guide missiles in an environment that includes smoke, dust and fog. It will be important to determine the threshold level of obscurants beyond which the missile guidance command link does not work.

The ADATS missile should have the capability to maneuver and then hit targets. The use of laser warning receivers may increase the number of maneuvers performed by enemy fixed-wing aircraft when ADATS attempts to

engage them on the battlefield. Operational tests should determine the range at which the missile is no longer effective against maneuvering targets.

Rapid Successive Engagement Capability. It is important to determine how reliable certain subsystems are when they are used in rapid succession. The optics and lasers of ADATS must remain in alignment after successive missile firings. Missiles should be able to be launched in rapid succession. Only single shots occurred in the test, with contractor maintenance permitted between shots. The capability of ADATS to engage multiple targets in rapid succession is unknown.

Safety/Manprint. The live firing was conducted by contractor-supplied personnel because there was no safety release for U.S. military personnel to fire. Future testing will determine whether representative soldiers can successfully and safely operate ADATS to include launching and guiding missiles to target impact, in a representative operational environment.

Mobility. ADATS must perform its mission while maneuvering with the combined arms battalion task force consisting of main battle tanks and armored personnel carriers. Boresighting and adjustment before each firing were permitted. The degree to which the various optical sensors, laser optics and launch mecnanisms remain aligned after ADATS has performed tactical maneuvers is unknown. Future live firing should occur only after ADATS conducts a road march or movements typical of those it would make in combat. Except for routine crew actions, there should be no maintenance between a road march and missile firings. Future testing will determine if ADATS meets the Army's tactical mobility requirements.

Survivability. The survivability of ADATS was not evaluated during the LOS-F-H test. Survivability will be explored in future testing. Detectability assessments should be made using optical and infrared photographs of ADATS taken while it is tactically employed. It should also demonstrate how well it can perform in the face of an anti-radiation missile (ARM) threat. ADATS should perform its mission using passive-only (nonradiating) techniques. This would entail turning off its search radar and perhaps its laser rangefinder. The degradation in ADATS' ability to perform its mission while in the passive-only mode will represent a measure of ADATS' susceptibility to ARMs.

The vulnerability of ADATS subsystems to artillery fragments and small arms fire was not addressed in the test. Martin Marietta has already proposed additional armor and hardening for the ADATS turret, radar, electro-optics module and missile canister. Once this additional armor is in place, ADATS should should be required to demonstrate its improved survivability against artillery fragments and small arms fire.

Mutual Interference. Testing a tactical unit, which adheres to planned deployment, tactical and doctrinal concepts, will allow issues such as mutual

interference of radars to be addressed. Tactics and doctrine were not available and only one ADATS was tested at a time.

Baseline Comparison. The forward area of a division is currently defended against low-altitude aircraft by Stinger, Chaparral and Vulcan. These three air defense systems will be included in future operational tests to determine if ADATS improves operational effectiveness and suitability over the current baseline systems.

Reliability. The ADATS tested was a prototype vehicle maintained by system-contractor personnel. Future reliability testing needs to address how the system performs after field maneuvers, sustained use and airlift, and after maintenance by typical Army field units. In addition, reliability needs to be assessed on a number of production-line models. Future testing must also determine the logistics concept required to support and maintain ADATS in the field.

FAAD C^2I Interoperability. There was no FAAD C^2I system available for this test. Future testing will determine whether ADATS can operate with the FAAD C^2I system.

Gun Performance. The gun system was not available for testing. Future tests must assess the effectiveness, suitability and reliability of the gun system. In addition, total system reliability and performance must be accessed after being subjected to the shock and vibration associated with gun firing.

Performance Degradation Due to More Realistic Play by the Threat. The performance of ADATS obtained in the recent test is probably higher than will be observed in future operational tests or in wartime. For example, during the test the target aircraft flew scripted profiles with longer exposures than typical of past operational tests. The extent of degradation when confronting a responsive enemy is unknown.

OT&E ACTIVITY

The LOS-F-H Non-Developmental Item Candidate Evaluation (NDICE) was conducted from July 1987 through November 1987 at Oscura Range, White Sands Missile Range, New Mexico. This office had two to four persons on site monitoring test conduct and data analysis activities during the entire test period. The tests measured the relative ability of the candidates to detect, acquire, track, launch against and intercept simulated threat aircraft under a variety of expected battlefield conditions. These conditions included night operations and countermeasures such as jamming, flares, chaff and obscurants.

The tests were conducted in two phases. The acquisition and tracking phase consisted of positioning two candidates at a time to defend an asset--in this case, a tank. A series of attacks against this defended asset and fly-bys representing transiting enemy aircraft were then made by fixed- and rotary-wing aircraft. Intermingled with these aircraft were friendly aircraft. In this head-to-head competition, the air defense unit had to sort friend from foe and detect, acquire and simulate an engagement against the enemy aircraft

The head-to-head competition methodology was designed to ensure that differences in observed performance were due to differences in system capability and not uncontrolled changes in test conditions or conduct. Except for cases where the operation of one system interfered with that of another, all combinations of head-to-head competition were conducted, and fighting positions were periodically reversed. Further, analytic studies were made after the test to determine if conditions such as candidate position during a trial and learning across trials affected the results. They did not. In addition, the crews manning the air defense units during this phase were soldiers--chosen to represent typical operational crews.

The other test phase was live fire. Each candidate system fired 10 missiles. The droned targets simulated a variety ofthreat profiles under countermeasures and, in one presentation for each candidate, in smoke. The presentations included eight rotary-wing target profiles since the rotary-wing threat at ranges of four kilometers or more is significant. During this phase, technical information on missile tracking, guidance, reliability and susceptibility to countermeasures appropriate for that system were gathered. Due to the absence of a safety release, the missiles were fired by system-contractor-supplied crews. Chronologically, the live fire phase preceded the acquisition and tracking phase.

CONDUCT OF THE TEST

Live Fire. The live fire phase tested system performance after trigger pull: missile tracking, missile guidance, missile trajectory, fusing and warhead event. Each LOS-F-H candidate fired 10 missiles at full-size target drones. During each firing a single target was presented to a single LOS-F-H candidate. No one candidate fired more than twice in succession. This was done to ensure that any change in environmental conditions would not favor one system over another.

This competition included eight helicopter presentations, since the greatest threat to front-line friendly forces is enemy helicopters. Moreover, the inability of defenders to meet the threat from standoff helicopters was a factor in the cancellation of the Sgt. York. Table 1 describes the target presentation types. The sites used for live firings included background clutter and the potential for radar multipath interference.

Table 1. Conditions for LOS-F-Live Fire Target Presentations

Target Presentations	Target	Intercept Profile	Countermeasures Range (Km)	Environment
1	UH-1	Hover (Tower)	6.0	Benign
2	UH-1	Hover (Tower)	4.0	CM
3	QUH-1	Hover	3.5	CM
4	QF-100	Incoming	5.0	CM
5	QF-100	Crossing/ Maneuver	5.0	CM
6	QUH-1	Hover	6.0	CM
7	QUH-1	Hover	5.0	CM
8	UH-1	Hover (Tower)	6.0	CM
9	UH-1	Hover	4.0	CM
10	QUH-1	Crossing	4.5	CM

<u>Acquisition/Tracking</u> The acquisition/tracking trials required the LOS-F-H candidates to attempt to detect, track, identify and engage targets. The engagement sequence terminated at the point where the missile was calculated to have intercepted the target. The candidates had to track their targets until their system predicted the missile would have intercepted the target.

The LOS-F-H candidates were tested two at a time during the acquisition/tracking trials. That is, for a particular mission of aircraft passes, two candidates would attempt to engage the targets in the airspace. The two candidates were positioned approximately 250 meters apart. Midway between the candidates and 300 meters in front of them was an M-60 tank that served as the asset which the candidates were defending. No more than two candidates were tested at a time because some of the radars interfered with each other. Thus, Liberty was tested only with ADATS. All the other candidate pairs--ADATS-Paladin, ADATS-Rapier, and Paladin-Rapier--were tested during the acquisition/tracking trials.

Both rotary-wing and fixed-wing targets were presented during the acquisition/tracking trials. In addition, friendly aircraft were intermingled with hostile aircraft. The targets were presented to the LOS-F-H candidates in a scripted, orchestrated manner. The missions were repeated for each pair of candidates. This allowed the two candidates, "A" and "B" tested on one day to see the same target profiles that candidates "C" and "D" saw on some other day. The number of mission scripts and the

presentation of each were arranged so that the soldiers manning the candidates would not know which script they would see.

Scripting the target profiles and pairing the candidates during testing enabled each system's performance to be compared in a meaningful way with that of the others. Scripting ensured that the candidates not paired with one another saw the same type and sequence of target profiles. Pairing ensured that both systems in the pair saw the same profiles. That is, any imprecision in exactly replicating target profiles was controlled because the two candidates paired together physically in the head-to-head competition saw precisely the same profile. The only testing difference between two paired candidates was that they were located at slightly different positions. Neither of the two positions was thought to be or subsequently proved to be more favorable. As further insurance, the candidates were rotated between the two positions.

Several types of countermeasures were used during the acquisition/tracking trials. Jamming capabilities expected to be found on the battlefield were simulated. In addition, flares, chaff, IR jammers and obscurants were employed on many of the acquisition/tracking trials.

TEST RESULTS

Live Fire. While all the contractors complained before the test that the test was too easy, the live fire phase revealed weaknesses in all the candidate systems.

The spread of results allowed discrimination between the candidates in a number of areas, including countermeasures susceptibility and man-machine interface problems.

Acquisition and Tracking. The results from the acquisition and tracking test indicated an overall difference in capability between one candidate and the other three. The difference was statistically significant at the 99 percent confidence level. The differences between the other three candidates were dependent on the specific test conditions. Against hovering-standoff, rotary-wing aircraft, conclusions were possible with between 89 and 98 percent confidence.

Overall, it was possible to determine which candidates engaged targets most often. Further, the performance of individual candidates can be expressed in a statistically significant sense, i.e., the test results did not occur by random chance, but instead reflected true differences between the systems. The differences in performance were confirmed by using different techniques to analyze the same test data. In particular, both a pairwise comparison of the candidates' performance on a single aircraft pass-by-pass basis and an aggregate analysis of performance yielded the same conclusions.

Further examination of the data is continuing to yield more information about specific technical performance parameters, such as engagement timelines and human factors, and about the causes of the observed performance. These further analyses are expected to increase our understanding of how the systems behave and to reveal areas for improvement and further testing.

Quality control on the data base is also continuing. Tests on the data base as the quality control process has continued indicate that, although some of the technical parameters of the engagements may change, these changes to the data files will not affect the conclusions discussed above.

SUMMARY

Observations and analyses by this office support the selection of ADATS. However, since the proposed system will be changed somewhat from the prototype presented for testing, it is not possible to predict the amount of engineering-development and technical testing which will be required to permit an informed decision on whether or not to enter low-rate initial production. Moreover, the limited scope of this test and absence of a free-play threat resulted in higher demonstrated performance than is likely to be obtained in future operational tests or in wartime.

PEDESTAL MOUNTED STINGER (PMS)

SYSTEM DESCRIPTION

The Pedestal Mounted Stinger (PMS) consists of a High Mobility Multipurpose Wheeled Vehicle (HMMWV), radio, identification friend or foe (IFF) system, a standard vehicle mounted launcher and a weapons platform pedestal consisting of a fire-prediction system and operator station. The system includes eight Stinger missiles and a 50-caliber machine gun. The Stinger missiles may be individually removed, fitted with gripstock and fired as a man portable air defense system (MANPADS) weapon.

BACKGROUND

The PMS concept was considered to offer the potential for (1) extending the capability of the Stinger missile to nighttime and adverse weather operations, (2) decreasing out-of-range engagements, (3) providing a self-protection capability, (4) having a shoot-on-the-move capability and (5) having the capability to engage targets in rapid succession. During the acquisition/tracking and live fire phases of testing these potential capabilities were tested and compared to MANPADS.

OT&E ISSUES

The PMS test was originally planned to use only basic Stinger missiles. As a part of the review and approval process, the DOT&E directed that Stinger-POST missiles also be tested, since the technical characteristics are somewhat different from the basic Stinger, and that MANPADS be used as a baseline for purposes of comparison. As a non-developmental item candidate evaluation (NDICE), the test was limited in scope, and further operational testing will be required to determine the system's effectiveness and suitability for use on the battlefield. The following questions could not be addressed in this test and are appropriate for future tests:

- Can the PMS system safely launch Stinger missiles over the full 360 degrees of launcher operation?

- What is the PMS's ability to identify targets?

- What is the PMS's ability to optimize a fire control system?

- Can the PMS rapidly, successively engage targets with eight missiles and reload?

- Does the PMS meet the air transportability requirements of the heavy, light and special divisions?

- Does the PMS allow exchange of data and other information with FAAD C^2I?

- Is the integrated logistical support concept for the PMS adequate?

- What is the PMS's capability when operating in the weather, terrain and vegetation of central Europe?

- What is the ability of the PMS to protect friendly forces?

- What is the PMS system's reliability, especially of launch mechanisms?

- What are the nighttime capabilities of Stinger missiles?

- What are the PMS operating capabilities of troops of varying aptitudes?

o Does the PMS system improve operational effectiveness and suitability over the current systems, including Chaparral RSS and Vulcan?

OT&E ACTIVITY

The PMS NDICE consisted of operational and technical tests of the three PMS candidates (Avenger, Crossbow, and Scorpion) and MANPADS (Stinger). The operational tests were conducted at North McGregor Range, New Mexico, March-May 1987, and included acquisition/tracking trials with the basic Stinger and Stinger-POST missiles against single and multiple targets and a live fire demonstration. The tests and data-analysis activities were monitored by representatives of this office.

All four systems competed in the acquisition/tracking trials with the basic Stinger missile against single targets. The Army eliminated the Scorpion during the PMS NDICE competition because the system failed to meet the weight (and thus transportability) requirements. The Scorpion was approximately 1,600 pounds over the 8,600 pound requirement, and the Army deemed the contractor's plan to eliminate weight unacceptable.

A total of 199, 188, 179, and 60 valid aircraft passes were executed for the Avenger, Crossbow, Scorpion, and MANPADS, respectively, during the acquisition/tracking trials with the basic Stinger against single targets. During the Stinger-POST trials against single targets, a total of 750, 745, and 764 valid aircraft passes were recorded for the Avenger, Crossbow, and MANPADS, respectively. During the acquisition/tracking trials against single targets, several test conditions were systematically varied. These systematically varied test conditions included light (day/night), electro-optical countermeasures (EOCM and benign/IRCM), a mission oriented protective posture (MOPP 0/MOPP 4), cueing (cued/uncued), aircraft type (fixed wing rotary wing) and mission configuration (stationary remote on-the-move). In addition, both friendly and hostileaircraft were flown. Performance, Manprint, and reliability and maintainability (RAM) data were collected during these trials.

The Avenger, Crossbow, and MANPADS had 11 valid aircraft presentations each during the acquisition/tracking trials with the basic Stinger and Stinger-POST missiles against multiple targets. During the live fire, the Avenger and Crossbow fired two basic Stinger missiles and one Stinger-POST missile at one-fifth scale fixed-wing drones (MQM-107s). MANPADS also fired a Stinger-POST missile.

OT&E ASSESSMENTS

The PMS candidates demonstrated that they could acquire; track and engage targets at night during the Stinger-POST trials. MANPADS was relatively ineffective at night.

MANPADS had a marginally larger percentage of out-of-range engagements than did the PMS systems. Thus the PMS candidates "saved" missiles relative to MANPADS. However, the price paid for saving missiles was that, under daylight conditions, the PMS systems engaged a lower percentage of hostile aircraft which entered the missile boundary than achieved by MANPADS.

During the acquisition/tracking phase of testing, the 50-caliber machine guns were rarely used. To date, live fire of the guns has not demonstrated that they can hit moving or stationary targets inside the missile "dead zone."

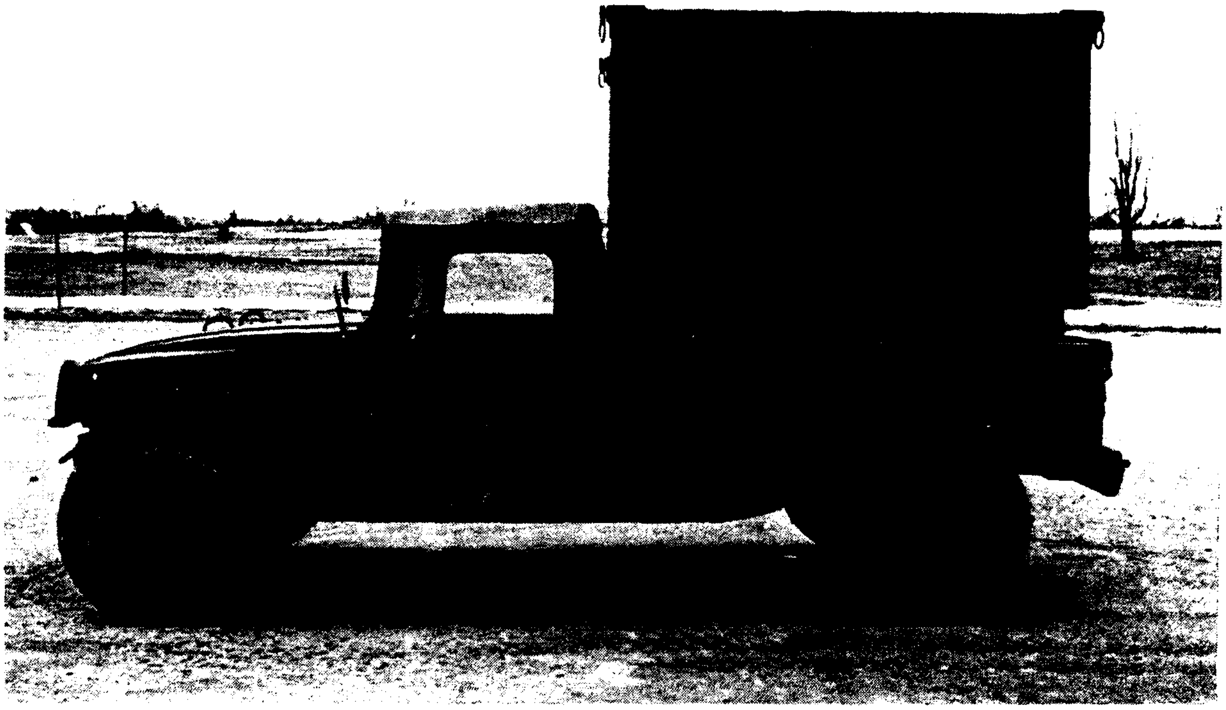
The PMS candidates demonstrated that they could acquire and track targets and launch Stinger missiles while on the move. MANPADS does not have this capability. However, the relative importance of "leap-frogging" versus shooting on the move as a means of protecting a maneuver force was not tested.

The rapid successive engagement capabilities of the PMS systems were not adequately tested. It is our view that, in the limited testing that did occur, the PMS candidates appeared only marginally better than the capabilities of one MANPADS gunner.

SUMMARY

The Avenger and Crossbow systems demonstrated that they could launch basic Stinger and Stinger-POST missiles during the day and at night and from the stationary, remote and on-the-move configurations. Further tests are required to address the operational effectiveness and suitability for use on the battlefield.

HIGH MOBILITY MULTI-PURPOSE WHEELED VEHICLE (HMMWV)



SYSTEM DESCRIPTION

The HMMWV is a high mobility multi-purpose wheeled vehicle using a common chassis to accommodate payloads in the 1/4 ton to 1 1/4 ton range in the combat, combat support and combat service support roles. It is a full-time four-wheel drive wheeled vehicle incorporating a V-8, 6.2 liter diesel engine, a 3-speed automatic transmission, a 2-speed transfer case, power steering and independent front and rear suspension. The initial HMMWV Group I variant involved vehicles with a gross vehicle weight (GVW) of 7,700-8,200 pounds. Group II variants have a GVW of 8,660-9,100 pounds. The Army is also evaluating a 9,400 pound variant (M1069) to be used as a prime mover for the towed lightweight M119 howitzer and the M167A1 towed Vulcan air defense weapon system.

In the combat role, the HMMWV will be used for anti-armor, reconnaissance, rear area combat operations, base defense and close air support control. In the combat support role, the weapons carrier and cargo versions of the HMMWV will be used in command, control and communications (C3); fire support team; target acquisition; naval gunfire control; air defense battlefield

obscuration; and nuclear, biological, and chemical (NBC) reconnaissance operations. In the combat service support role, the HMMWV cargo and ambulance versions will support logistics, cargo carrier, and medical evacuation operations.

BACKGROUND

The HMMWV program is an outgrowth of three previous programs: the combat support vehicle program in the late 1960s which was to serve as a wheeled vehicle carrier for the TOW weapon system; the 3/4 to 1 1/4-ton Expanded Mobility Tactical Truck (EMTT) program, which was to develop a replacement for the Gama Goat; and the High Mobility Weapons Carrier (HMWC) program, which was intended to develop a weapons platform for the TOW and other armament systems.

In July 1980, the joint mission element need statement (JMENS) for the HMMWV was approved. The HMMWV is programmed as a replacement for selected M151 jeeps, M274 mules, M561 Gama Goats, and M792 1 1/4-ton ambulances. The total acquisition cycle for the HMMWV has been expedited to replace these aging vehicles. A concurrent developmental test II and operational test II (DT II and OT II) was concluded in September 1982. Follow-on evaluation for the initial HMMWV variants (Group I vehicles--HMMWV-TOW and HMMWV-Utility) was completed in December 1984. The first unit was equipped in September 1985. The Group II variants (HMMWV S-250 shelter carrier (M1037), 4-litter ambulance (M997), and 2-litter ambulance (M996) are to replace the M561 Gama Goat shelter carrier, the M718 front line ambulance, and M792 Gama Goal Ambulance.

The HMMWV Group II variants are currently in the full-scale development phase of the materiel acquisition process and are slated for a production and deployment decision in FY88. An operational assessment (OA) to support this decision was conducted at Fort Lewis, Washington, during the period June-October 1987.

DOT&E has reviewed and commented on the HMMWV 9,400 pound variant (M1069) TEMP, and the OTEA test design plan for the HMMWV Heavy Variant Group II. DOT&E personnel have also observed testing of the HMMWV M1069 (9,400 pound variant) at Aberdeen Proving Ground, Maryland.

OT&E ISSUES

The primary OT&E issues examined during the OA and the initial production test (IPT) of the HMMWV Group II Heavy Variant were mobility, reliability, availability, maintainability and supportability. Additional issues regarding recovery and tiedown procedures, ambulance communications, training, human factors and safety were also examined.

OT&E ASSESSMENT

The appropriate documentation (test reports and independent evaluation reports) for the HMMWV Group II Variants will not be available for a full assessment until after the completion of both the OA and the IPT in FY88. Overall, the Group II variants did experience some difficulties during the recently completed OA. Our primary concerns centered around RAM and mobility due to the increased weight. A DOT&E assessment of this system will be provided to Congress.

SUMMARY

While almost all of the basic vehicular components are the same among HMMWV variants, all models tested are different in terms of gross vehicle weight and most are different in terms of their functional roles and missions. Additional testing of the HMMWV Group II variants may be required in order to ensure that any significant deficiencies noted in the OA have been corrected. The requirement for additional testing will be determined by our assessment of the OA and the complementary IPT.

M1A1 ABRAMS MAIN BATTLE TANK

SYSTEM DESCRIPTION

The M1A1 tank is a product improvement of the M1 tank. It incorporates a 120 millimeter gun system, a microclimate cooling system with integrated nuclear, biological, chemical (NBC) protection, a modified power and drive train and increased armor protection. Two types of 120mm ammunition are available: The M829 kinetic-energy round which uses a depleted uranium penetrator, and the M830 high explosive anti-tank, shaped-charge round. The 120mm ammunition is semicombustible, leaving only a stub metal case in the breech after firing. The German manufactured tungsten alloy penetrator round (DM23) can also be fired by the M1A1.

BACKGROUND

The operational test was managed by the Army's Operational Test and Evaluation Agency (OTEA) and executed by the Training and Doctrine Command Combined Arms Test Activity at Fort Hood, Texas, beginning in October 1983 and concluding in April 1984. At the request of the DOT&E, a live firing test by soldiers of production-like service ammunition was added. This added phase was conducted at Aberdeen Proving Ground in November and December 1984. The tests were adequate for assessing the battlefield performance of the full-scale engineering development model tank. We reported that the M1A1 tank offered significant improvements over the M1 tank, with increased firepower and added armor protection, and found it to be operationally effective and suitable. However, we also concluded that a continuing program of follow-on operational test and evaluation (FOT&E) would be required to assess ongoing improvements to the ammunition bustle door seals, back-up fresh air ventilation system, accuracy of the M830 HEAT ammunition, and the potential for an automatic muzzle reference system.

OT&E ACTIVITY

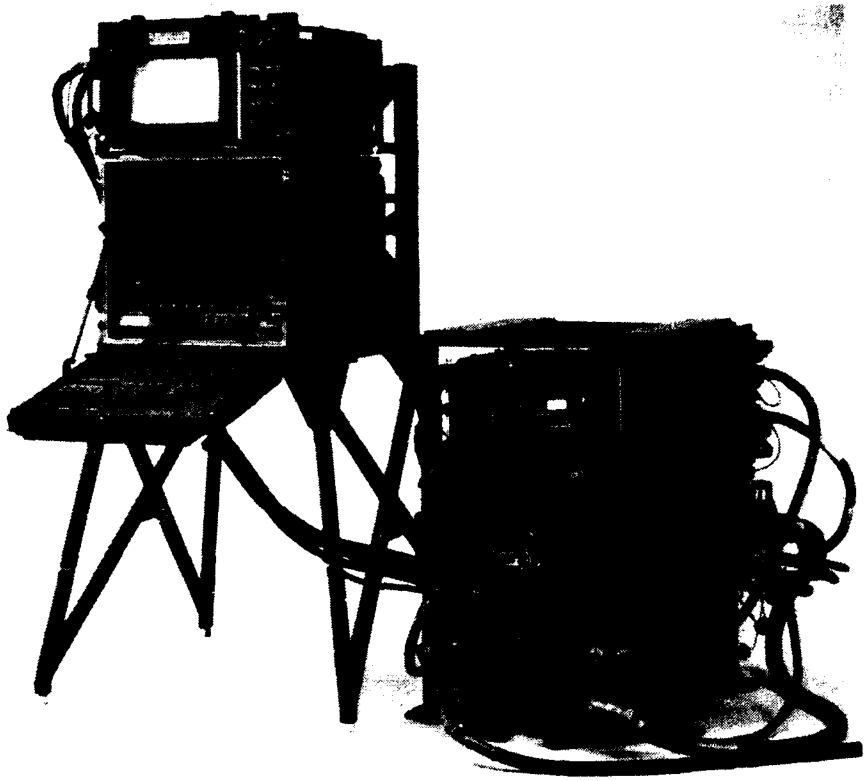
A follow-on evaluation (FOE) of the M1A1 was conducted by OTEA during the period 12 January - 30 June 1987 at Fort Bliss, Texas, with the 3rd Squadron, 3rd Armored Cavalry Regiment. The purpose of the FOE was to determine if the M1A1 tank could be calibrated using the procedures prescribed in Field Circular (FC) 17-12-1A1, Tank Combat Tables; that material deficiencies disclosed during the M1A1 Operational Test (OT) II enumerated above, had been corrected; that the M1A1 tank could be supported with planned logistic concepts; and that M1A1 tank crews could effectively use the on-board (NBC) system.

As a result of the test plan review by this office, the Army revised the FOE test design plan (TDP) to change the nature of the test from one of noninterference with the 3rd Armored Cavalry Regiment training activities, to one of minimal interference to facilitate testing. In addition, the test command structure was changed to place the Commander OTEA clearly in charge with authority to interfere with the units activities if necessary in order to complete all test requirements in a timely manner.

OT&E ASSESSMENT

Representatives from this office monitored the conduct of the test and we are now reviewing and analyzing the recorded data. Our preliminary assessment indicates that long-range gunnery has not yet been tested. A key element of justification for the 120mm gun was the increased lethality and range that it offered over the less robust 105mm gun. This office believes such capability must be assessed rather than accept a measured capability at the lesser ranges traditionally specified in the Tank Gunnery Tables. Several mechanical failures, such as cracks in the turbine recuperator were noted and will require corrective action. Assessment of the M1A1 FOE will be completed in FY88.

MANEUVER CONTROL SYSTEM (MCS)



SYSTEM DESCRIPTION

The Army Maneuver Control System (MCS) is a command and control system to aid in the effective employment and operational control of the tactical maneuver force, as part of the overall force level and maneuver control system. Automated transmittal, storage, retrieval and display of battlefield information is intended to improve handling of message traffic loads and reaction times and demonstrate the potential for automatic interaction with information systems. Echelons from maneuver battalion through corps are planned to have such assistance in the form of the MCS computer network.

MCS has been restructured several times, with the latest system structure being an umbrella MCS system consisting of a mixture of various separate systems and technologies. These include a military specification system known as the Tactical Computer Terminal (TCT) or the TCT Prime (TCT with bubble memory) in the production and limited field use phase; a later ruggedized commercial system known as the Tactical Computer Processor (TCP) and Analyst Console (AC) in the low-rate initial production (LRIP) phase and referred to as non-development items (NDIs); and future common hardware and software which is in the planning phase under the Army Command and Control System (ACCS) program.

Earlier system structures which included military specification versions of the Tactical Operations System (TOS) and Tactical Computer System (TCS) have been terminated. Militarized computers and peripheral devices are to occupy critical or severe nodes within the netted system, while NDI computers and peripheral equipment are considered for less critical stations. Current TCT, TCT Prime, TCP and AC procurements address brigade to corps levels and are currently structured to transfer to the reserves when the ACCS hardware is available, tested and integrated into the system. MCS applications programs are written in Ada software language.

BACKGROUND

Development of the TCS and TCT started in 1975 as part of the TOS program. TOS was terminated in 1979 and MCS initiated, consisting of the TCS and TCT. Prototype devices were deployed to Europe in 1980 and 1981. The Army approved the required operational capability (ROC) for the MCS on 30 June 1982. In a May 1983 Army Systems Acquisition Review Council (ASARC) the MCS was type classified as standard and the TCTs and TCS entered full scale production. In addition the investigation of a NDI development to parallel the military specification item development was directed, with excessive cost being the driving factor. This led to October 1983 guidance to provide a limited quantity of the military specification equipment to the entire active force and to supplement it with NDI hardware in those locations where the enhanced survivability was not absolutely essential. The TCP was selected as an NDI surrogate to TCT in 1984.

In February 1986, the Army determined that the operational value of the TCS did not justify its cost, leading to termination of TCS procurement and transfer of its bubble memory to some TCTs (called TCT Prime) to replace the TCS and a decision to initiate procurement of NDI TCPs. Related guidance was provided by the vice chief of staff of the Army in February and May 1986 to conduct adequate testing to support future decisions. Based on this guidance, agreements between Army test and evaluation and combat development communities identified three test requirements: successful completion of a follow-on evaluation I (FOE-I) to support TCT/TCT Prime fielding decisions; successful completion of an operational assessment (OA) to support FY87 procurement orders of NDI TCPs; and successful completion of an FOE-II of the full-up MCS system with all military specification and NDI components to support FY88 NDI orders.

OT&E ISSUES

The MCS has passed through various systems engineering phases and decisions since 1975. These phases have not been supported with results from traditional operational test and evaluation (OT&E). Attempts have been made to obtain results from these various systems being deployed to VII Corps since 1981 for field experience and feedback. A test and evaluation master plan (TEMP) was first submitted for OSD approval by a deputy under secretary of the Army memorandum dated 23 April 1987. The TEMP was not current, did not include Commander, Army Operational Test and Evaluation Agency (OTEA) approval, included no issues for both phases of follow-on OT&E (FOT&E-I and FOT&E-II), and did not permit OSD review prior to either the TCP OA, which had already been conducted in July 1986, or the TCT/TCT Prime FOT&E-I, which began only two days later and was conducted 25-29 April 1987. The TEMP was not approved by OSD. No OT plan has been submitted for OSD approval.

NDI equipment procurement has become two-phased, with the first phase awarded in July 1987 as an LRIP which constituted about 45 percent of the total planned NDI program. FOT&E-II could be delayed from FY88 to FY89, increasing the potential to expend FY88 funding for the NDI full-rate production order (potentially a total buy of all MCS hardware prior to the availability of ACCS) without a determination of operational effectiveness and suitability.

OT&E ACTIVITY

In March 1981 the vice chief of staff of the Army approved fielding of engineering development versions of the TCS and TCT to VII Corps and judgement of their performance in a number of field exercises in place of traditional OT&E. These have included: VII Corps Command Post Exercise (CPX) in May and September 1981, Field Training Exercise (FTX) in September 1982, CPX in March 1983, and FTX in September 1984. The Army's Training and Doctrine Command (TRADOC) Combined Arms Test Activity (TCATA) was designated as the test organization and conducted evaluations of MCS during these exercises. TCATA conducted the TCP OA at Fort Carson, Colorado from 28 July to 1 August 1986 and the TCT/TCT Prime FOT&E-I in Europe from 25-29 April 1987, issuing test reports dated September 1986 (TCP OA) and September 1987 (TCT/TCT Prime FOT&E-I). OTEA directed the OA and FOT&E-I and issued its independent operational assessment (IOA) reports dated 24 April 1987 (TCP OA) and 26 June 1987 (interim draft TCT/TCT Prime FOT&E-I). OTEA plans the final assessment report on FOT&E I for December 1987 release.

This Office did not observe either the OA or the FOT&E-I because the TEMP and OT plan were not approved for adequacy of OT&E to determine operational effectiveness and suitability. We and OTEA outlined improvements required to the TEMP on 11 September 1987 and suggested an Army brief to OSD to facilitate approval.

OT&E ASSESSMENT

OTEA concluded that the NDI TCP has the potential to emulate some of the functions and capabilities of the military specification TCT. The TCP demonstrated a limited ability to survive and operate in the intended environment because it was set up and torn down in 20 minutes by user personnel, readily adaptable to a variety of power sources, and transportable in tactical wheeled vehicles. However, the OA was conducted with an unverified software version (version 9.11), which had anomalies in data-base functions and communications interface. The TCP provided for OA was the 16-bit HP 9920U, while the TCP production contract is for 32-bit HP 320 microprocessors. The system was not certified through development testing as being ready for OA, and the usefulness and functionality of the complete MCS could not be evaluated due to communication interface failures, the lack of a full complement of TCT/TCT Primes and the immaturity of the software. OTEA found that the TCT/TCT Prime as fielded during FOT&E-I made a marginal contribution to operational effectiveness.

OTEA reported that the results of FOT&E-I would not support the fielding or materiel release of the fully militarized (TCT/TCT Prime) equipments at this time. OTEA has also suggested a force development test and experimentation (FDT&E) to learn how to develop and use MCS in the field.

This office's assessment is that adequate operational test and evaluation has not been performed on MCS and that results of past test and evaluation activity do not confirm the operational effectiveness and suitability of either the military or the NDI equipment. An innovative test strategy such as FDT&E will be required to provide test results necessary to support informed decisions on any additional procurements.

SUMMARY

MCS has not been adequately tested in the field and has not demonstrated operational effectiveness or operational suitability for typical users in typical combat scenarios. Additional system level OT&E is required. An approved TEMP and OT plan are required. FOT&E-II of the integrated MCS should be successfully completed and a DOT&E assessment conducted and reported prior to any future MCS procurement actions.

OH-58D SCOUT HELICOPTER (AHIP)

SYSTEM DESCRIPTION

The Army Helicopter Improvement Program (AHIP) developed the OH-58D scout helicopter through major modification to existing OH-58A helicopters. Modifications and improvements include addition of a mast mounted sight, a day/night target acquisition and designation system, improved hot-day and nap-of-the-earth performance, and space, weight and power for incorporation of the air-to-air stinger missile. These features provide a day/night/adverse weather command and control, surveillance and target acquisition capability and a capability to designate targets for Army and Air Force laser- homing munitions. The mast-mounted sight enhances OH-58D survivability by allowing surveillance, target acquisition and target designation from extended stand-off ranges with minimal exposure of the helicopter to enemy radar and electro-optical detection devices.

BACKGROUND

An operational test II (OT II) was conducted at Fort Hunter Liggett, California, from September 1984 to February 1985 to provide the information necessary to assess operational effectiveness and suitability. Overall, the testing was conducted in as realistic an operational environment as could be obtained within time and safety constraints.

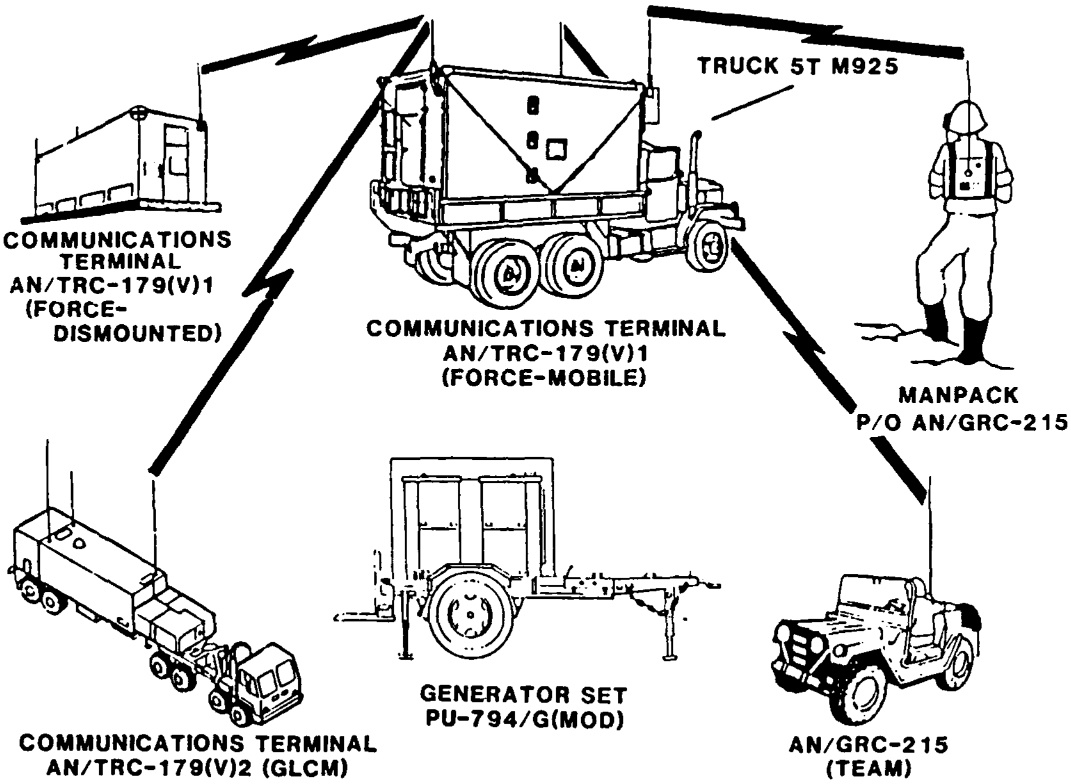
On the basis of our assessment of the results of OT II, this office concluded that: the OH-58D demonstrated an operationally effective capability in the field artillery aerial observer role. However, in the attack and air cavalry roles, the OH-58D offered no statistically significant advantage in combat effectiveness over the existing OH-58C helicopter. Due to observed shortcomings in tactical employment, training and doctrine, further operational tests were required to support use of OH-58D in these two roles. We further concluded that, while the OH-58D is generally suitable for use, improvement to the mast mounted sight and control data system designation accuracy, reliability, fault detection and isolation were required.

In view of the test results, the Defense Systems Acquisition Review Council (DSARC) recommended production of the OH-58D for the field artillery aerial observer role only, and asked that further operational tests be undertaken before authorizing procurement for other uses. Planning for such a test was well underway when the Army determined it could no longer afford the OH-58D and terminated the program as well as the planned test. However, recognizing that air cavalry units had need for scout aircraft, the Army conducted the limited- scope Army aerial scout test (AAST) at Fort Hunter Liggett, California, during March, April and May 1987. While this test included various aircraft, we limited our review to the OH-58C and OH-58D aircraft.

OT&E ACTIVITY

The AAST employed production models of the OH-58D operated by seasoned crews under simulated battlefield conditions. The test was limited to reconnaissance functions and did not fully address the attack role. Since the Army has terminated the OH-58D program, this office has suspended its assessment. However, the data are on file, and an assessment can be completed and a report submitted if the OH-58D program is reactivated.

REGENCY NET



SYSTEM DESCRIPTION

Regency Net includes a new secure and anti-jam high-frequency radio communication system to replace an existing system. The intent is to provide required security, survivability, flexibility, control, reliability, maintainability, and capability to counter jamming threats.

BACKGROUND

The Regency Net program was initiated by the Army in 1983 as a non-developmental item (NDI) program. Contractor testing known as Pilot Network System Test-1 (PNST-1) was included in the contract. PNST-1 was to be completed prior to exercise of production options which were included in the fixed price contract and scheduled for completion in thirty-nine (39) months. The program was not reviewed at Army Systems Review Council (ASARC) level for milestone decisions and did not include independent operational test and evaluation (OT&E) by the Army Operational Test and Evaluation Agency (OTEA).Regency Net is not a major DoD acquisition program, but was designated by the DOT&E for oversight in accordance with 10 USC 38. Problems experienced during developmental efforts led to schedule delays. The Army restructured the contract in March 1987, and provided for concurrent completion of developmental efforts and award of production options beyond low-rate initial production (LRIP) without results of PNST-1 or OT&E to support the decision. PNST-1 was conducted 29 Aug st to 28 September 1987, after award of the prooduction options.

OT&E ISSUES

The Army proceeded beyond LRIP after designation of the Regency Net program for DOT&E oversight and without conduct of approved OT&E to support the procurement actions. This office was not consulted or advised concerning program changes or contract restructuring with award of production orders beyond the LRIP. It is understood that OTEA and the Deputy Under Secretary of the Army (Operations Research) have since provided for conduct of an independent OT&E. However, no supporting test and evaluation master plan (TEMP), OT&E concept, or operational test (OT) plan has been provided to OSD.

OT&E ACTIVITY

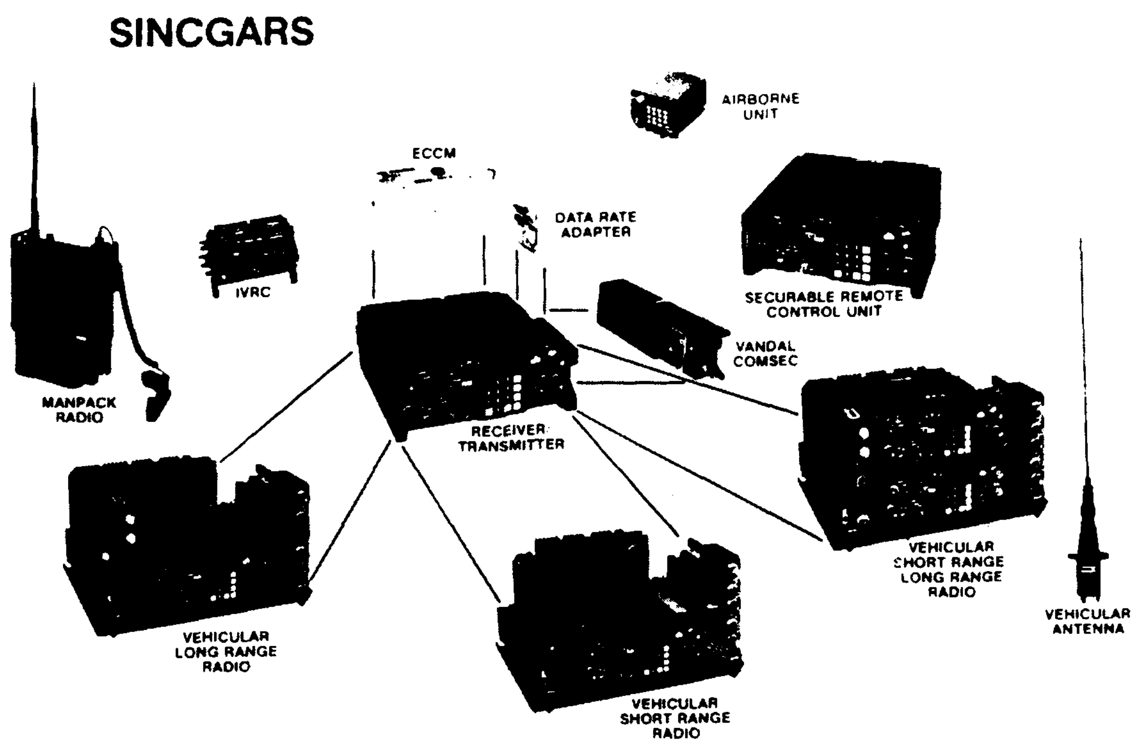
No OT&E was planned, conducted or reported during FY87. A draft TEMP was provided to this office informally, and comments were returned, including an expression of the requirement for independent OT&E. A meeting was chaired by the DOT&E in May 1987 at which the Army was reminded the OT&E is required for Regency Net and is to be preceded by an approved TEMP, an OT&E concept brief and a DOT&E approved plan. OTEA subsequently prepared an outline OT plan for Army review and projected OT&E to be conducted in FY88. However, no Army-approved TEMP, OT concept or OT plan have been provided to this office as of this writing. Results from PNST-1, the development test which was conducted from 29 August to 28 September 1987, were not completely evaluated or reported during FY87. It is our understanding that an Army OT&E is now planned for conduct in 1QFY89.

OT&E ASSESSMENT

This office provided OT&E policy, procedures, guidance and consultation to the Army, including the Regency Net program manager. OT&E has not been conducted to support procurement beyond LRIP. OT&E has not been adequate and results are not available to confirm that Regency Net items are effective and suitable for combat.

SUMMARY

Regency Net development efforts are not complete. The Regency Net contract was restructured in 1987, and production options beyond LRIP were exercised before conduct of PNST-1 or OT&E. Results from PNST-1 must be reported and evaluated. Regency Net OT&E has not been adequately planned or initiated to date. A TEMP, OT concept and OT plan must be approved to provide adequate results for assessment and reporting of Regency Net operational effectiveness and suitability.



SYSTEM DESCRIPTION

The Army Single Channel Ground and Airborne Radio System (SINCGARS) is a major acquisition program in the low-rate initial production (LRIP) phase for the original design from the first production contractor. SINCGARS is a VHF-FM combat net radio communications system to provide secure and anti-jam command and control communications capability for infantry, artillery and armor units critical to the conduct of land battle. The SINCGARS family of radios is intended to be capable of transmitting voice, tactical data, and record traffic in a frequency hopping or single channel (frequency) mode.

BACKGROUND

Different configurations of SINCGARS are being provided to replace the current AN/VRC-12 family of standard vehicular radios and the AN/PRC-77 manpack radio series. Army development and LRIP of an airborne SINCGARS radio is also underway to replace the AN/ARC-54/131 family, AN/ARC-114 and AN/ARC-186 (FM only) airborne radios in Army aircraft. The Air Force and Navyare proceeding with separate developments of SINCGARS interoperable airborne and shipboard radio systems. Army development to integrate the National Security Agency (NSA) communications security (COMSEC) function into the SINCGARS (called ICOM) is nearing completion. Production of the new ICOM configuration is to begin with an engineering change proposal (ECP) to change some of the LRIP radios from the original to an ICOM design. ICOM has become the Army's objective system design. A second source is being sought to build ICOM configurations that are form, fit and function interchangeable and interoperable with the first-source design.

A limited operational test (LOT) was conducted by the Army Operational Test and Evaluation Agency (OTEA) using four advanced development model SINCGARS radios from the two competing contractors in November 1982. These test results were used to support the Army decision to accelerate from advanced development to selection of a LRIP design in an attempt to provide a 1985 initial operational capability (IOC). A maturity operational test (MOT) was conducted at Fort Riley, Kansas, from October through December 1983 by OTEA to provide information to validate the Army LRIP decision. Operational personnel from the 1st Infantry Division used 21 advanced developmental model radios in an operational test to determine SINCGARS effectiveness, survivability and suitability. An Army Research Institute report on human factors findings observed during the MOT was also used to assess performance. The operational reliability demonstrated during MOT was less than 400 hours mean time between failure (MTBF) against a requirement for 1250 hours MTBF with 80% confidence. Performance deficiencies during MOT led to radio modifications which were retested during an operational assessment (OA) conducted from August through September 1984 at Fort Huachuca, Arizona. Additional data were gathered from emerging results of development tests conducted at Fort Huachuca and Fort Sill, Oklahoma. Based on these OA and emerging results the Army awarded LRIP options I and II, respectively, 3,200 (FY84 funded) and 8,250 (FY85 funded) SINCGARS radios.

OT&E ISSUES

The Army was advised by OSD in December 1984 that a comprehensive follow-on operational test and evaluation (FOT&E) of production radios was required prior to the planned award of the original contract option III for 16,000 radios, which was defined to constitute proceeding beyond LRIP. The Army was also directed to discontinue multi-year procurement plans and to submit a test and evaluation master plan (TEMP) to OSD for approval, including reliability and built-in-test thresholds. To date, there is no OSD-approved TEMP for SINCGARS.

The contractor experienced reliability and other problems in transferring from advanced development to production, which led to an extensive reliability-growth and problem-fixing effort. The contractor has completed this extended reliability growth program and has started formal production reliability assurance testing (PRAT) as required by the Army prior to delivery of the radios for FOT&E and other uses. Delays in completion of tests and delivery of LRIP radios resulted in the loss of procurement funds in the FY86 and FY87 budget processes, and the requirement for a Secretary of Defense certification of the need to continue the program (FY86).

The LRIP radio reliability and other problems resulted in an FY86 Army survey of available industry radios and later comparison to the available SINCGARS radio using some issues and criteria from the 22 May 1986 draft SINCGARS TEMP. The Army has indicated that the SINCGARS radio performed better than any other candidate radio in the survey, but these events were limited, investigative in nature and not observed by this office.

The Army is planning to restructure the original production contract to minimize production of the LRIP design and transfer the new ICOM development design into production by engineering change proposal (ECP) applied to 2,000 of 8,250 radios previously ordered on option II (LRIP), over 9,000 of 16,000 radios yet to be ordered on option III (full-rate production), and all 16,000 radios yet to be ordered on option IV (continuing full-rate production) of the original production contract. OT&E of the ICOM system has not been conducted to support these decisions. The Army is seeking a second source contractor to build form, fit and function interchangeable and interoperable versions (versus build to print) of the ICOM radio, which has neither completed development by the current development/ production contractor nor been operationally tested and evaluated.

Interoperability of the separately developed SINCGARS- capable systems (SINCGARS LRIP design, SINCGARS ICOM system design, second source SINCGARS ICOM design, Air Force airborne HAVE SYNC design, and Navy developments) has not been demonstrated, nor has NATO interoperability. These issues were to be addressed in an Army-approved TEMP to have been submitted to OSD by 15 March 1987, but to date, this document has not been received.

OT&E ACTIVITY

The Army's OTEA conducted an assessment of nine NDI candidate radios and the available SINCGARS production design radios from 25 August to 24 October 1986 at Fort Riley and prepared a report dated 7 May 1987. The SINCGARS contractor also conducted exercises with soldiers at Fort Gordon, Georgia. OSD reviewed the program with the Army in December 1986 and issued a decision memorandum on 12 February 1987. During the December 1986 review, this office suggested that the Army accelerate FOT&E of the current production design to provide earlier feedback to the ICOM design and ECP activities and conduct an IOT&E of the ICOM prior to ordering the additional ICOM radios by ECP of the option III full-rate production radios. The OSD decision memorandum

requested quick resolution of the testing issues by Army submittal of the approved TEMP by 15 March 1987 and by Army submittal of an operational test (OT) plan for DOT&E approval of initial operational T&E and FOT&E. To date, neither the TEMP nor the OT plan has been submitted.

OT&E ASSESSMENT

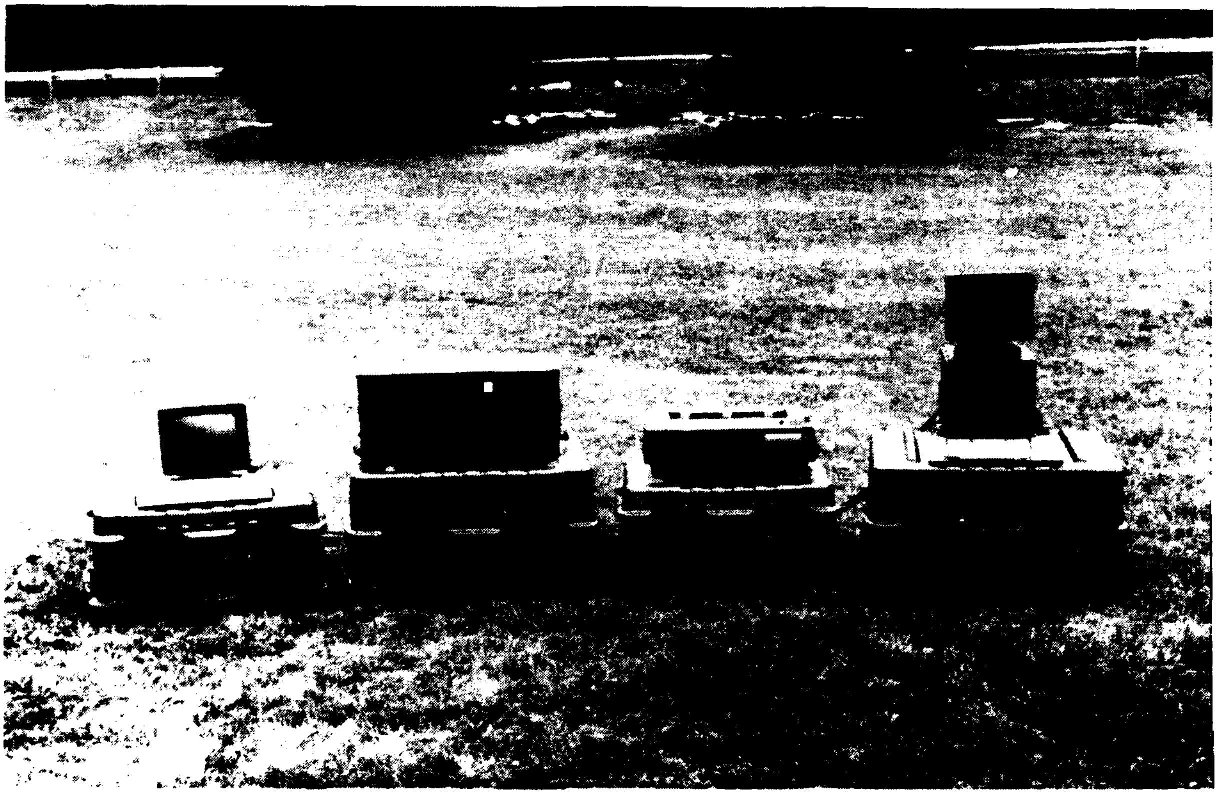
According to the Army, the current SINCGARS production design exhibited the highest reliability of 10 radios in the NDI operational assessment at Fort Riley. The Army has also assessed the SINCGARS as one of the three best performers of the 10 radios. In the Army's view, unless SINCGARS requirements are reduced, a major development effort would be required to make any of the NDI candidates suitable for an interim/replacement VHF-FM combat net radio. Further, the Army has indicated that the latest production design SINCGARS ground radio has been improved significantly through the reliability growth activities and has a very strong potential to pass revised PRAT program requirements of 1250 hours MTBF, leading to potential first delivery of LRIP radios in early FY88.

This office's assessment is that OT&E has not been conducted to confirm that the radio is operationally effective and suitable for proceeding beyond LRIP (option II) orders. FOT&E of the LRIP design is required to address issues that include operational reliability and maintainability, procedures for radio and net operations in secure and frequency-hopping modes, jam resistance, mutual interference, airborne radio operations, interoperability of basic and ICOM versions and multi-Service interoperability. IOT&E of production representative items for the newly developed ICOM system should be conducted before proceeding beyond LRIP with this new design. IOT&E of the second source ICOM will likely be required to confirm interoperability, operational effectiveness and suitability ofthe different design. FOT&E confirmation of NATO interoperability is required at some point in the program.

SUMMARY

An Army-approved current TEMP has not been provided for OSD approval. FOT&E of the current LRIP system design, IOT&E of the proposed new ICOM system design, and IOT&E of the second-source ICOM system design is required. Interoperability of the current LRIP systems, proposed new ICOM systems and potential new second-source ICOM systems must be confirmed. Multi-Service and NATO interoperability must also be confirmed. An OT plan is required for DOT&E approval of near-term FOT&E, subsequent production representative ICOM IOT&E, and interoperability OT&E. Final decisions for proceeding beyond existing option II LRIP contract orders should be preceded by OT&E and a DOT&E report providing this office's assessment of the adequacy of testing and the effectiveness and suitability of the systems actually tested.

TACTICAL ARMY COMBAT SERVICE SUPPORT COMPUTER SYSTEM (TACCS)



SYSTEM DESCRIPTION

The TACCS system is a militarized Burroughs Model 26 microcomputer which employs commercially available state-of-the-art technology. To enhance the system's operability in field environments, the components were consolidated into one chassis (master logic block) that is shock mounted in a ruggedized housing. The system is designed to operate in semi-controlled environments such as buildings, tents and the interiors of tactical vehicles. TACCS will be used in two configurations, V1 and V2. The V1 configuration consists of the master logic block, visual display unit, keyboard and printer. The V2 configuration consists of a V1 plus a remote logic block, visual display unit and keyboard.

BACKGROUND

The TACCS is expected to provide data entry, inquiry, retrieval capability, editing, printing and data transmission, and is intended to replace the punched-card equipment now being used to support the administrative operations of Army divisions with respect to supply, maintenance, ammunition, transportation, medical support and personnel. These functions require 11 separate and unique TACCS software programs and dedicated TACCS hardware.

The system was operationally tested at Fort Gordon, Georgia, from 5 June to 30 July 1986 by personnel of the United States Army Communications-Electronics Board under the overall supervision of the Army's Operational Test and Evaluation Agency (OTEA). Test plans were approved by the DOT&E and representatives of this office observed the testing. After reviewing the test results, we concluded and reported that: "The TACCS Follow-on Operational Test was adequate to assess the operational effectiveness and suitability of the computer system in performing the three applications currently developed for field use. Testing was conducted 24 hours a day in a realistic field environment. The results obtained are considered highly representative of what a commander could expect when TACCS is deployed with a unit in the field."

"As tested, the TACCS demonstrated an operationally effective capability to perform the following Army-wide applications: the Standard Installation Division Personnel System (SIDPERS), the Standard Army Maintenance System (SAMS), and the Standard Army Retail Supply System (SARSS). Additional planned applications have not yet been tested. While the TACCS is suitable for use, improvements to the operators manuals are required to permit users to readily and fully utilize the TACCS capability."

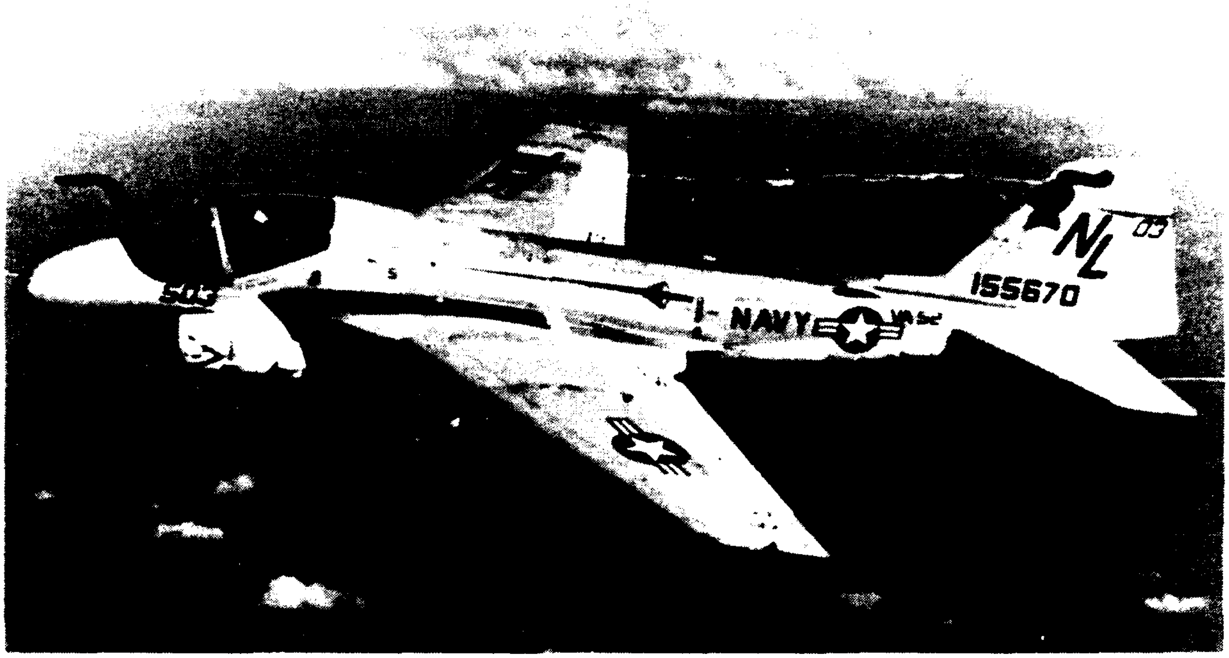
SUMMARY

The Army revised the manuals during FY 1987 and included the recommended improvements. The new manuals are adequate to support field use of the TACCS system.

PART IV

NAVY OT&E

A-6E INTRUDER



SYSTEM DESCRIPTION

The A-6E Intruder, the only Navy and Marine Corps all-weather attack aircraft, is a long-range, twin-engine, carrier-based, medium attack aircraft capable of very accurate navigation and delivery of nuclear and non-nuclear weapons from five external stores stations. Its avionics system includes a microminiaturized digital computer, a solid-state weapon release system, a single integrated track and search radar and a carrier airborne inertial navigation system (CAINS). An added capability, the target recognition and attack multisensor (TRAM), has been procured under a multiyear production contract since FY76.

This major subsystem includes an infrared sensor, laser ranger/designator, and laser receiver. It provides the capability for night surveillance, target identification and the delivery of laser-guided weapons.

The A-6E system/weapons integration program (SWIP) aircraft is an upgrade of the A-6E TRAM aircraft. It includes an updated electronic warfare (EW) suite, an improved weapons management and control system (the avionics interface set (AIS)) for an increased standoff weapons capability and a new operational flight program (OFP), E-240, which will also be the baseline OFP for the A-6F.

The A-6F is a modified A-6E, which will include increased capability digital avionics, new engines with more thrust, a new multimode air-to-surface/air-to-air radar and minor airframe changes to include two additional wing weapons stations.

BACKGROUND

The A-6E (prototype aircraft) first flew in March 1970, was introduced to the fleet in December 1971 and first deployed in September 1972. The first full TRAM aircraft was delivered in September 1979, with an IOC of December 1979. Procurement of the A-6E SWIP is scheduled to continue through FY97. The A-6F was proposed to meet the threat of the 1990s and beyond by achieving increased reliability, maintainability, survivability and performance through various changes to the baseline A-6E SWIP aircraft. In addition, reduced inventories of the A-6E combined with increased requirements drove the decision to procure additional all-weather attack aircraft. The first flight of the A-6F was on 25 August 1987, marking the beginning of development testing. Operational testing has been delayed pending resolution of the A-6F's procurement status.

OT&E ISSUES

The issues to be addressed during A-6E SWIP testing include evaluation of the operational effectiveness and suitability of OFP E-240, new avionics and the upgraded EW suite and standoff weapons capabilities and their effect on aircraft vulnerability and survivability.

OT&E ACTIVITY

Operational testing (OT-IIA) of the A-6E SWIP commenced in July 1987 and was completed in November 1987. Test events assessed the weapons delivery accuracy (WDA) for unguided weapons, navigational accuracy and effectiveness of the EW suite, in addition to suitability issues. A-6E SWIP OPEVAL (OT-IIB) began in November 1987 and is expected to be completed in March 1988. Test results will be available after completion of OPEVAL.

AIM-54 PHOENIX

SYSTEM DESCRIPTION

The AIM-54 Phoenix is an all-weather, long-range, conventional-warhead air-to-air missile utilizing semiactive midcourse guidance and active terminal guidance. Six Phoenix missiles can be carried aboard the F-14A/A+/D, which can perform nearly simultaneous missle launches against six targets in both clear and jamming environments. The AIM-54C incorporates upgrades of selected components of the AIM-54A. It is designed to improve missile lethality, stream-raid discrimination, ECCM performance, high and low altitude performance, reliability, maintainability and availability. Additional changes have been made to the AIM-54C through an engineering change proposal (ECP-82) to further improve its ECCM capabilities and permit employment on the F-14D in a sealed/dry (liquid coolant no longer required) configuration. This missile is sometimes referred to as the AIM-54C+.

BACKGROUND

The AIM-54C entered development in 1976 in response to an increasingly sophisticated and capable threat. (AIM-54A production ceased in 1979.) The AIM-54C completed operational evaluation (OPEVAL) in August 1984 and IOC was declared in December 1986. The first phase of follow-on test and evaluation (FOT&E) (OT-IIIA) was completed in FY86 and described in our FY86 Annual Report. A decision on full production is planned in 1988 after full evaluation of the AIM-54C with ECP-82 during OT-III B1 and OT-III B2. OT III B1 will test the AIM-54C (ECP-82) with 2.1 firmware. OT-III B2 will test the AIM-54C (ECP-82) with 3.0 firmware.

OT&E ISSUES

Issues identified for FOT&E (OT-IIIB1/B2) concern the operational effectiveness and operational suitability of the AIM-54C with ECP-82 and its readiness for full fleet introduction. Specific items to be addressed include: correction of the design and production deficiencies associated with the FSV-10/A safety and arming device, target detecting device (TDD) performance, and missile modifications not tested in OT-IIIA.

Other areas of DOT&E interest identified in the TEMP approval letter are: OT&E of second source missiles and OT&E in the presence of electromagnetic interference (EMI).

OT&E ACTIVITY

OT-IIIB1 of production AIM-54C's with ECP-82 began in September 1987 after our approval of the TEMP and test plan and is expected to be completed in April 1988. OT-IIIB2 is scheduled to commence soon thereafter. We consider the TEMP and test plan to be very detailed and extensive (in particular, the scope and intensity of planned ECM testing during OT-IIIB is impressive. Each launch made of the missile will be tested and a vast majority will be live-warhead shots.

A member of our staff was at Pt Mugu, California, during both of the missile launch profiles completed so far during OT-IIIB1. We plan to continue our close observation of Phoenix operational testing.

AV-8B HARRIER II

SYSTEM DESCRIPTION

The AV-8B Harrier II is a second generation, single seat, transonic, vertical/short takeoff and land (V/STOL), light attack aircraft powered by a single, vectored thrust F402-RR-406 engine. Capable of operating from short fields, forward sites, roads and surface ships, the AV-8B entails such improvements over the AV-8A as a larger super-critical wing, positive circulation flaps, lift improvement devices, enlarged intakes and advanced composite materials applications in major structural elements of the wing, forward fuselage and empennage. An updated weapons system is incorporated to improve weapons delivery effectiveness and tactical flexibility. The mission computer and its associated Omnibus software are used to manage most communication, navigation and weapon systems functions. The AV-8B is capable of carrying a wide variety of conventional air-to-ground weaponry, the GAU-12 25mm gun and Sidewinder air-to-air missiles.

A night attack system will be incorporated as an engineering change proposal (ECP) to the AV-8B. It expands the daylight visual meteorological conditions (VMC) mission capabilities of the aircraft to include night VMC

through the use of various complementary subsystems. These include a navigation forward-looking infrared (FLIR), an expanded head up display (HUD), a night vision goggles system (NVGS), compatible cockpit lighting, and a color moving map/display. In addition, target acquisition capabilities are expected to be expanded during both day and night operations.

The TAV-8B is a two-place trainer, derived from the AV-8B, which retains maximum commonality in handling qualities, inflight performance and logistics support. The AV-8B cockpit is moved forward and a second cockpit with its associated equipment is placed above and behind. The TAV-8B is slightly heavier than the AV-8B, and certain systems such as the angle rate bombing system (ARBS) and the electronic warfare (EW) suite have been deleted.

BACKGROUND

Designed to replace the A-4M and AV-8A to meet the Marine Corps' light attack requirements through the year 2000, the AV-8B first flew in November 1981, completed OPEVAL in March 1985 and was declared IOC in August 1985. FOT&E of various subsystems, ordnance and updates of the Omnibus mission computer software continues.

The AV-8B night attack system is intended to increase the time available for the AV-8B to accomplish its primary mission by over 40%. The system is expected to provide a night tactical navigation capability to levels approaching or equaling day VMC, improve its day and night operational capabilities and increase night flight safety. The AV-8B night attack system entered phase I of combined development/ operational testing (DT/OT) in August 1987, which is expected to be completed in February 1988.

The TAV-8B was developed to satisfy the Marine Corps' requirement for a V/STOL training aircraft for the AV-8B. Its primary function will be to train V/STOL attack pilots for the fleet. It will be employed as a transition trainer to familiarize Marine Corps pilots with the flight controls, flight characteristics, weapons and basic tactical use of the AV-8B. The TAV-8B began OT in August 1987.

OT&E ISSUES

AV-8B Omnibus software issues focus on improvements to and deficiency corrections of the previous mission computer software and expansion of the air-to-ground weapons clearances. Issues associated with the electronic warfare (EW) suite, the ALQ-164 and ALR-67, focus primarily on the effectiveness and suitability of the suite once installed in the AV-8B, in particular its effect on aircraft survivability. The critical operational issue evaluated during AV-8B night attack system follow-on operational test

and evaluation (FOT&E) is whether the AV-8B will demonstrate the same operational effectiveness and suitability in night, minimum-effective-light-level, VMC conditions that it possesses under daylight VMC conditions. Issues addressed during TAV-8B testing focus on its ability to satisfy the requirement for a V/STOL trainer.

OT&E ACTIVITY

Operational testing of the ALQ-164 and ALR-67 EW suite began in July 1987 and was completed in November 1987. The test data and results are still being analyzed by Commander, Operational Test and Evaluation Force (COMOPTEVFOR). Our assessment will be included in our next annual report. Operational testing of the AV-8B night attack system commenced in August 1987 and is expected to be completed in February 1988. TAV-8B OT-IIIA was conducted from 13 to 31 August 1987.

OT&E ASSESSMENT

The Omnibus III mission computer software, the follow-on to the Omnibus II software, was judged by COMOPTEVFOR to be operationally effective and suitable. Testing was completed on 27 March 1987. The Omnibus IV sofware, which updates the Omnibus III, was determined by COMOPTEVFOR to be operationally effective and suitable. Testing was completed on 12 September 1987.

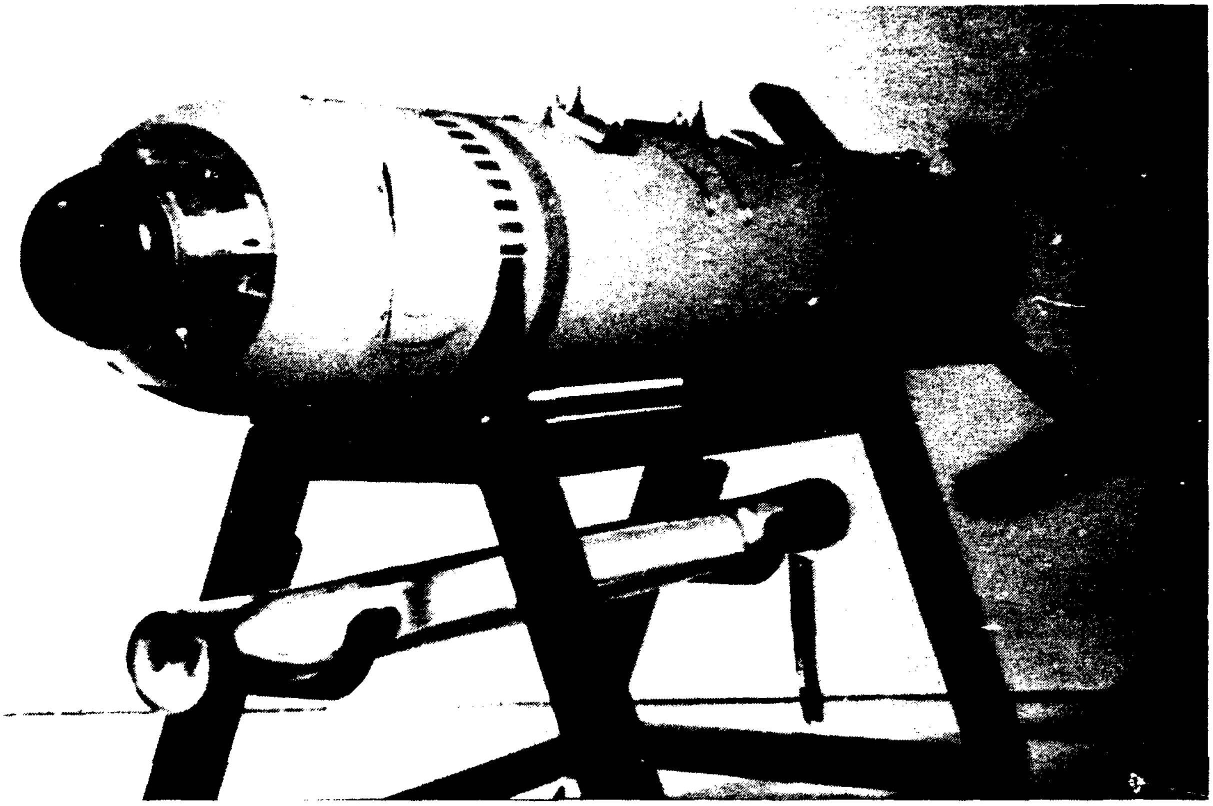
All quantitative effectiveness criteria for Omnibus III and IV were achieved with no deficiencies noted in the software changes. However, there were minor software-related deficiencies identified during both operational tests. The Omnibus III deficiencies were either corrected by Omnibus IV or deferred to future software updates. Deficiencies noted in Omnibus IV testing were designated for correction in Omnibus V or follow-on software.

As a result of OT-IIIA, COMOPTEVFOR concluded the TAV-8B has the potential to be operationally effective and suitable. The DOT&E flew the TAV-8B in August 1987 and found that the aircraft demonstrated a dramatic improvement in handling qualities over the AV-8A.

SUMMARY

Continuing FOT&E of the Omnibus sofware to correct deficiencies and improve system capabilities is planned for on an annual basis. Further testing of the night attack system and other system upgrades are planned in 1988.

BLU-80B CHEMICAL WEAPON SYSTEM (BIGEYE)



SYSTEM DESCRIPTION

The Bigeye is a 500 pound class freefall canister binary chemical weapon designed for single or multiple carriage on tactical fighter aircraft. Designed to be capable of supersonic carriage and high subsonic release airspeeds, Bigeye is intended to be compatible with level, loft and dive deliveries. It produces a persistent nerve agent from two nontoxic chemicals which are physically separated within the Bigeye airframe until the weapon has been released from the aircraft. The basic components of the Bigeye weapon include the FMU-140/B dispenser proximity fuze, reactor assembly (including liquid reactant (QL)), balionet assembly (including sulfur reactant) and tail fin assembly.

BACKGROUND

Inherent problems with the storage. transportation and employment of toxic chemical weapons led the DoD to seek a safer, more reliable method to achieve chemical warfare deterrence. A binary concept, two nontoxic chemicals physically separated until used, evolved as the most plausible solution. In 1976 the Navy was designated the executive agent for development of the Bigeye, with the Air Force as the participating Service and the Army as the supporting Service responsible for chemical development and evaluation. Funding shortfalls in FY80 resulted in a restructuring of the program and a decision to place it in a hold status at the end of that year. Renewed interest in the program during FY81 resulted in a decision to complete development as quickly as possible. The design of the system was changed in FY82 to allow the chemical reactant to mix after the weapon was released from the aircraft ("off-station mixing"). Operational testing of this design began in FY85.

OT&E ISSUES

The operational effectiveness issues being examined during operational testing include delivery accuracy of the system, capability of providing desired deposition densities when delivered with operationally realistic maneuvers, successful employment under all conditions encountered during mission operations and whether the required delivery maneuvers will result in an unacceptable increase in delivery aircraft vulnerability. Suitability issues include reliability, availability, maintainability (RAM); logistic supportability; environmental compatibility; interoperability; training; and safety during transportation, handling, loading, delivery and jettison from the aircraft.

OT&E ACTIVITY

The Navy and Air Force are conducting joint operational testing in two phases. The Navy completed Phase I testing (OT-IIA) on 5 September 1985. Twenty-two weapons were dropped at Naval Weapons Center, China Lake, California, and Dugway Proving Ground, Utah. The Commander, Operational Test and Evaluation Force (COMOPTEVFOR) concluded that the BLU-80/B was potentially operationally effective and potentially operationally suitable and recommended only limited fleet introduction until compliance with several recommendations.

Phase I of the Air Force IOT&E was conducted at Nellis AFB, Nevada, from April 1985 to February 1986. Twenty BLU-80B weapons were dropped from F-4 and F-16 aircraft at China Lake and Dugway. The Commander, Air Force Operational Test and Evaluation Center (AFOTEC) concluded that BLU-80/B operational effectiveness was satisfactory and operational suitability wasunsatisfactory, and recommended proceeding to low-rate initial production (LRIP).

Joint USAF IOT&E (Phase II) and Navy OT-IIB (OPEVAL) testing of Bigeye commenced January 1987. After 10 weapons were test dropped, the weapon was decertified in March 1987 by the Commander, Naval Air Systems Command (COMNAVAIRSYSCOM) due to excessive failures. During this pause in testing, the Navy conducted a failure-mode analysis and modified the tail-fin actuator assembly and the FZU-37 air turbine generator fuze. Recertification was approved in August 1987, and testing recommenced on 24 August. A member of the DOT&E staff witnessed portions of the testing, both on the ground at Dugway and in the air from an Air Force F-16 chase plane. Operational testing (OT-IIB) of a combined Navy and Air Force total of 58 weapons was completed in December 1987. COMOPTEVFOR will issue a final joint Navy/Air Force report in March 1988. Prior to approving the Bigeye test and evaluation master plan (TEMP) and operational test plan, this office persuaded COMOPTEVFOR to include in his final OT-IIB eport an Army appendix that will contain the results of the Army's effectiveness modeling based on chemical simulant data collected during OT-IIB.

Although the data analysis and evaluation for OT-IIB test results are not complete at this writing, preliminary results indicate that Bigeye is not operationally suitable, but operational effectiveness looks favorable. Because reliability was below threshold, this office requested that two independent producibility studies be done, one by OSD and one by the Navy. Based on the results of these studies and on the interim OT-IIB results, this office recommended that, if the President certified the Bigeye and if production was to begin, then production quantities must be held to a very low rate and further operational testing must be conducted on production weapons.

In January 1988, on the recommendation of the Secretary of Defense and in accordance with Section 152 of the National Defense Authorization Act for FY87 (Public Law 99-661), the President certified that (1) production of the Bigeye binary chemical bomb is in the national security interests of the United States, and (2) the design, planning and environmental requirements for production facilities have been satisfied. On recommendation of this office, production will be held to a minimum, no Bigeye bombs will be deployed, and production will not continue beyond the first lot unless the next phase of operational testing is fully successful.

Because of these recent programmatic developments, our beyond low-rate initial production (B-LRIP) report will not be published until after the next phase of operational testing. However, when data analysis from OT-IIB is complete, we will issue an interim report (in April 1988) to the Secretary of Defense and Congress on Bigeye operational testing to date.

SUMMARY

The recent phase of operational testing (OT-IIB) was completed in December 1987. Interim results indicate that the Bigeye is not operationally

suitable, but operational effectiveness looks favorable, pending completion of data analysis. The COMOPTEVFOR report will be published in March 1988. Because additional operational testing is scheduled in FY90, our final B-LRIP report will not be published until completion of the next phase of testing. This office will, however, provide an interim report to the Secretary of Defense and Congress in April 1988.

C/MH-53

SYSTEM DESCRIPTION

The CH-53E is an improved/growth version of the Navy/Marine Corps H-53A/D transport helicopter. It features a third engine, a larger diameter rotor, seven (versus six) main rotor blades, an uprated main transmission, and a greater maximum gross weight and payload capability. Maximum payload is 16 tons for the CH-53E vice 8 tons for the earlier H-53A/D aircraft. The CH-53E is currently in full production and is employed by both Marine Corps and Navy fleet units. A variant of the H-53E, the MH-53E, is currently in limited production for use in the airborne mine-countermeasures (AMCM) mission. There is 80% commonality between the MH and CH aircraft, with the main rotor, engines, transmissions and basic airframe being essentially the same.

BACKGROUND

The MH-53E is being developed as an engineering change proposal (ECP) modification to the CH-53E aircraft, to replace the RH-53D as the Navy's airborne AMCM platform. The MH-53E is designed to increase time on station and improve mission reliability, as well as to provide the increased tow capability required by new AMCM devices. Initial operational testing (OT-IIA) was conducted in 1984. Based on OT-IIA and development (DT-IIB) test results, a limited production decision was made in March 1985. DT-IID (TECHEVAL) was completed in October 1985.

Operational evaluation (OPEVAL) of the MH-53E was conducted in FY86 and reported upon in our FY86 Annual Report. OPEVAL test objectives included a determination of the MH-53's capability to stream, tow and recover AMCM towed bodies, navigate with the accuracy required to conduct AMCM operations, and conduct vertical on-board delivery and in-flight refueling from surface and airborne platforms. OPEVAL also assessed the survivability, vulnerability, reliability, maintainability and availability (RAM) of the MH-53.

OT&E ISSUES

Issues remaining from OPEVAL include recoverability with single-engine failure during tow operations, full-throw authority of the cyclic during emergencies, readability of the tension skew indicator, durability of the main and tail rotor bearings and rotor brake slippage.

OT&E ACTIVITY

No operational testing of the MH-53E occurred in FY87. Follow-on testing of transportability in the C-5 aircraft and correction of the deficiencies surfaced in OPEVAL commenced in the first quarter of FY88.

SUMMARY

It is our judgement that the MH-53 is operationally effective but is not yet operationally suitable. Test results do not support full production of the MH-53 until identified discrepancies are corrected and verified in further operational testing.

E-2C HAWKEYE

SYSTEM DESCRIPTION

The E-2C Hawkeye is a twin-engine, carrier-based aircraft with a five man crew. It is the third variant of a carrier- based airborne early warning/command and control system. Equipped with a tactical data system that includes both active and passive sensors, the E-2 functions as an airborne combat information center (CIC). It also provides area surveillance, strike force control, search and rescue, communications relay and air traffic control. Principal subsystems include the APS-138 radar and ALR-73 passive detection systems.

Improvements to the radar system are going forward under a two-stage update development program (UDP) identified as E-2C UDP Group I and E-2C UDP Group II. The Group I system modifications consist of a high speed processor (HSP) for the central computer and provisions for increased surface target detection and enhanced electronic counter-countermeasures (ECCM) for the radar (now called the APS-139). The Group II radar, designated the APS-145, includes the Group I improvements and also provides the radar with extended range, environmental processing, blind speed elimination, automatic

processing of long pulse video and an improved identification friend or foe (IFF) system. A T56-A-427 engine upgrade is being developed in parallel with the UDP to improve the E-2C's single engine flyaway capability, range and on station time.

BACKGROUND

The E-2C first flew in September 1972 and achieved IOC in February 1974. A preplanned product improvement (P3I) program was subsequently pursued. An advanced radar processing system (ARPS), designated the APS-125, became fleet operational in May 1978. The APS-125 was redesignated the APS-138 in FY 1983 with the delivery of the total radiation aperture control antenna (TRAC-A).

The P3I continues under the current UDP in response to increased crew and system tasking, increased density of air and surface targets with their associated electronic emitters, improved threat radar and communications jamming capabilities and advances in threat launch platforms and air-to-surface missiles.

OT&E ISSUES

The critical operational issues examined for both Group I and II included: detection, tracking, system management, survivability vulnerability, reliability, maintainability, availability, compatibility, interoperability, human factors and safety. In addition, the issues of training and documentation were addressed during Group I testing.

OT&E ASSESSMENT

Operational test and evaluation (OT&E) of the E-2C UDP Group II was conducted at Naval Air Station (NAS) Patuxent River, Maryland from 14 October to 3 November 1986. This phase of operational evaluation, in support of a decision for long- lead and nonrecurring funding, was to assess Group II's operational effectiveness and suitability. Issues addressed included: 1) capability to adequately detect and track air and surface targets in all operational environments; 2) system management capabilities; 3) survivability and vulnerability; 4) reliability, maintainability, compatibility, interoperability, human factors and safety.

Commander, Operational Test and Evaluation Force (COMOPTEVFOR) determined that the E-2C UDP Group II is potentially operationally effective and potentially operationally suitable. The E-2C demonstrated improved performance in basic overwater detection capability and in a jammed environment.

However, the system did not perform adequately in the automatic tracking of air targets over land or automatic tracking of maritime surface targets.

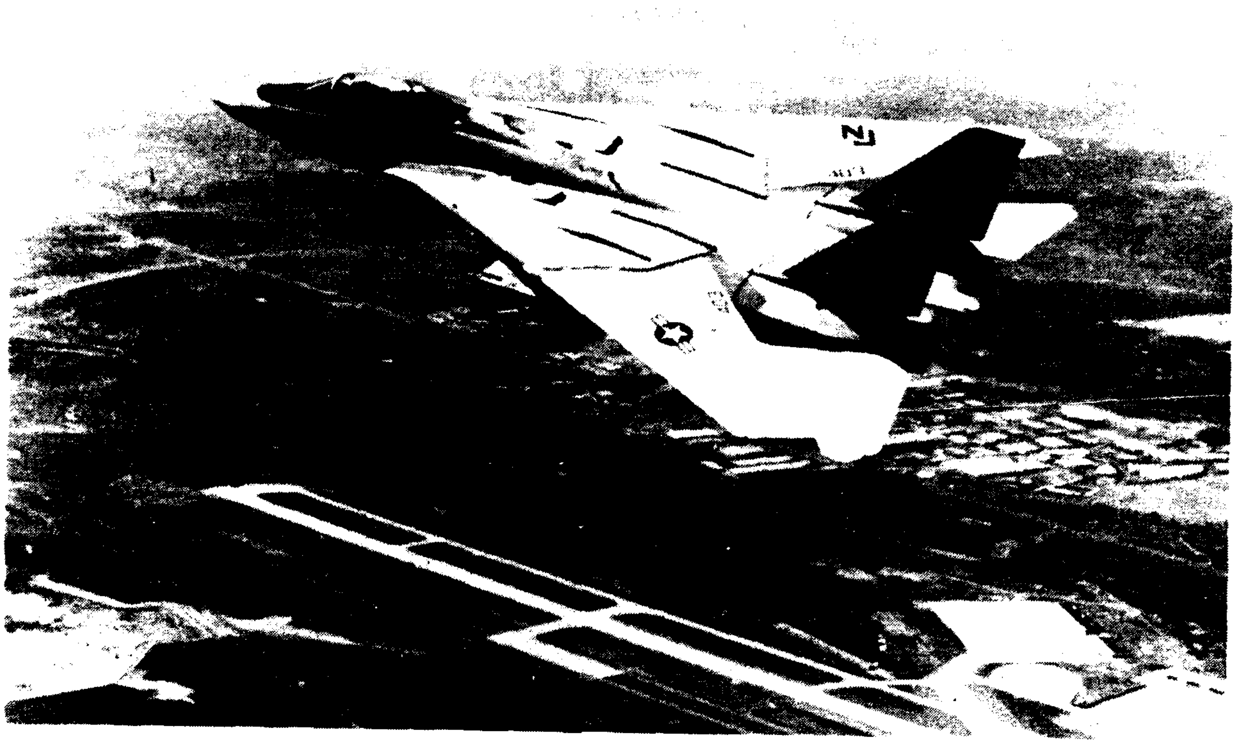
OT-IIB for E-2C UDP Group I was conducted from NAS Patuxent River, Maryland, from 17 August to 4 September 1987. The purpose was to assess the operational effectiveness and suitability of the UDP modifications and to continue tactics development. Test results will be utilized to determine whether to continue limited production. Preliminary, incomplete analysis by COMOPTEVFOR indicates Group I is marginally operationally effective and potentially operationally suitable. Current test results do not support continued limited production. Further development and additional operational testing is needed prior to resuming limited production and fleet introduction.

After completing some software changes and a hardware adjustment, OT-IIB phase II was accomplished from NAS Patuxent River from 12 to 21 December 1987. Based upon a quick-look evaluation by COMOPTEVFOR, Group I was judged to be potentially operationally effective and suitable.

Summary

Based upon the results of operational testing, the E-2C UDP Group II was approved for limited production. Group I OT-IIB phase II quick-look results indicate the software changes and hardware adjustment were successful and the system is potentially operationally effective and suitable.

F-14 TOMCAT



SYSTEM DESCRIPTION

The F-14A Tomcat is a carrier-based, two-seat, twin-engine, auto or manual variable-sweep-wing, all weather, supersonic, air-superiority fighter. It is capable of carrying the Phoenix, Sparrow and Sidewinder missiles together with an internal M-61 (20 millimeter) gun for fleet air defense or fighter roles. An air-to-ground capabililty is secondary and has never been fully developed. Its major subsystems are the AWG-9 weapons control system (WCS) and two TF30-P-414A engines. The AWG-9 is a software programmable WCS designed to detect and track multiple airborne targets at extended ranges and to prepare and fire the air-to-air missiles and M-61 cannon. The AWG-9/Phoenix missile combination gives the F-14 the ability to attack up to six targets nearly simultaneously at long ranges.

The F-14A Plus (A+) involves an engineering change proposal (ECP) to replace the current TF-30 engine with the F110-GE-400, a derivative of an Air Force engine. Associated engine accessories, structure, hydraulic, fuel system and ECS modifications will be incorporated, as well as provisions for the ALR-67 radar homing and warning (RHAW) system. The F-14D incorporates the same engine and associated modifications as the A+, but also includes major upgrades through new digitized avionics and a new digital radar (APG-71). The avionics will utilize a modern digital multiplex bus architecture and incorporate state-of-the-art avionics equipment such as JTIDS, ASPJ and IRST. The APG-71 will retain the high-peak-power output of the AWG-9 radar and provide for significant improvements in ECCM capability, reliability and maintainability. The F-14D's weapons capability will increase to include AMRAAM, HARM and Harpoon.

BACKGROUND

The F-14A first flew in December 1970 and became fleet operational in December 1973. In July 1983, a Secretary of the Navy memorandum delineated the required capabilities for an upgraded F-14A, the F-14D. The need for an early, limited upgrade, the F-14A+, was determined to be necessary due to safety and operability problems associated with the TF-30 engine. In September 1986, the Secretary of the Navy directed that the procurement of new production F-14Ds would be supplemented by remanufactured F-14A/A+s into F-14Ds. The F-14A production program is nearly complete. The F-14A+ is currently undergoing development testing, with operational testing scheduled to begin in spring 1988. The F-14D (avionics/radar) first flight took place on November 23, 1987.

OT&E ISSUES

Issues addressed during FY87 concerned the operational effectiveness and suitability of the F-14A operational flight program (OFP) 114B/P14B, specifically in its ECCM capabilities. The 114B/P14B OFP is the follow-on to the 114A/P14A OFP. The OFP is the software for the AWG-9 weapons control system.

OT&E ASSESSMENT

Limitations to scope of testing included nonavailability of the AWG-15F stores management system, an AIM-54C missile for air launch and targets fully representative of all possible threats. However, developmental test data for the AWG-15F and captive carry flight data for the AIM-54C indicate a low probability of failure in an operational environment. The AIM-54C has been successfully launched utilizing OFP 114B during AIM-54 OT-IIIB. Based on this information, the OFP 114B/P14B was judged operationally effective and suitable, and subsequently introduced to the fleet in June 1987.

SUMMARY

The F-14A is a mature weapons system which is undergoing minor modifications and updates during FOT&E. Major changes and improvements to the F-14 (F-14A+ and F-14D) will occur beginning in FY88.

F/A-18 HORNET

SYSTEM DESCRIPTION

The F/A-18A Hornet is a single-seat, twin-engine, carrier-based strike fighter. Designed to replace the F-4 and A-7, the F/A-18 is being employed in Navy strike fighter squadrons and Marine fighter attack squadrons. It has an internally mounted M-61 (20 millimeter) gun, carries the Sparrow and Sidewinder missiles in the air-to-air role and various nuclear and non-nuclear air-to-ground weapons in the strike role. It is also capable of dropping most air-deliverable mines. The aircraft incorporates a digital control-by-wire flight control system, multiplexed digital avionics and weapons control system and the APG-65 radar. It is powered by two F404-GE-400 engines. The F/A-18C involves major upgrades to the F/A-18A. These changes, grouped under engineering change proposal (ECP) 178, include provisions for new hardware systems with the associated software for ASPJ, AMRAAM, IIR Maverick and the flight incident recorder and aircraft monitor system (FIRAMS). Other changes to be incorporated are a left/right fuel system (ECP-162) and an improved environmental control system (ECP-35), which is not unique to the F/A-18C. Night attack, tactical reconnaissance and tactical air controller (Airborne) (TAC(A)) capabilities will be added in future F/A-18C/D's. The F/A-18B and F/A-18D respectively, are the two-seat variants of the F/A-18A and F/A-18C. These versions are currently being used for training only.

BACKGROUND

The F/A-18 first flew in November 1978 and completed OPEVAL in October 1982. IOC was declared in March 1983. Follow-on operational test and evaluation (FOT&E) of descrepancies discovered during OPEVAL and of the electronic warfare (EW) suite/HARM missile (not available for OPEVAL) was completed by August 1985. A program management proposal (PMP), approved by the Secretary of the Navy in January 1985, combines several new subsystems and improvements into a single block upgrade as part of an overall preplanned product improvement (P3I) program. Due to the significant changes in system capabilities resulting from this P3I, the model designation was changed from F/A-18A/B to F/A-18C/D. The F/A-18C/D with 87X operational flight program (OFP) is currently undergoing OT&E, scheduled for completion in April 1988. 3he OFP, associated with the aircraft's mission computers, inertial navigation system (INS) and stores management set (SMS), receives periodic updates which go through development and operational testing.

OT&E ISSUES

The major issues examined during FY87 FOT&E of the F/A-18A/B addressed the operational effectiveness and suitability of the 85A+ operational flight program (OFP), the follow-on software to the 85A* OFP, including correction of previously identified deficiencies.

OT&E ASSESSMENT

OFP 85A+ was assessed by Commander, Operational Test and Evaluation Force to be operationally effective and suitable and approved for fleet introduction in February 1987.

SUMMARY

Continued updates of the OFP are planned annually, to correct deficiencies and accommodate improved capabilities and upgrades to the F/A-18. FOT&E of the various aircraft modifications and ECPs is also planned.

FFG-7 GUIDED MISSILE FRIGATE

SYSTEM DESCRIPTION

The mission of the FFG-7 class guided missile frigate is to provide self-defense and effectively supplement planned and existing escorts in the protection of underway replenishment groups, amphibious forces and military shipping against subsurface, air and surface threats. The original (FY75) combat system suite on this class is being upgraded on FY79 and later year ships to include the light airborne multi-purpose system (LAMPS) MK III, a tactical towed array sonar (TACTAS - SQR-19), the naval tactical data system (NTDS Link 11), and integrated electronics warfare support measures (ESM - AN/SLQ-32(V)2). The FY75 combat system provides only short-range antisubmarine warfare (ASW) capability and lacks full NTDS. The FY79 combat system provides both long- and short-range ASW sensor and weapons systems capability as well as full NTDS capability. The FY84 combat system improvement will provide enhanced anti-air warfare (AAW) capability.

BACKGROUND

The guided missile frigate (FFG) program entered the conceptual phase in January 1971, leading to the development of the FFG mission and initial design. The ship system design was completed in April 1973. Contracts for detail design and construction of the lead ship were awarded to Bath Iron Works in 1973. The lead ship of the class (USS Oliver Hazard Perry (FFG-7)) was delivered to the Navy in November 1977.

Operational test and evaluation (OPEVAL) of the FFG-7 baseline combat system was conducted at the combat system test center (CSTC) Ronkonkoma New York, in 1975. Follow-on operational test and evaluation (FOT&E) was conducted in 1977 at the CSTC and in 1980 on board USS Oliver Hazard Perry.

No additional operational testing of the combat system has been conducted since 1980. However, individual components and subsystems have undergone further development and operational testing. USS Elrod (FFG-55) was commissioned in July 1985 and is the first FFG-7 class ship to have the complete FY79 combat system. Four follow-on ships will have the FY79 combat system installed, and previously commissioned ships will be back fitted. The FY84 combat system will be installed on USS Ingraham (FFG-61).

OT&E ISSUES

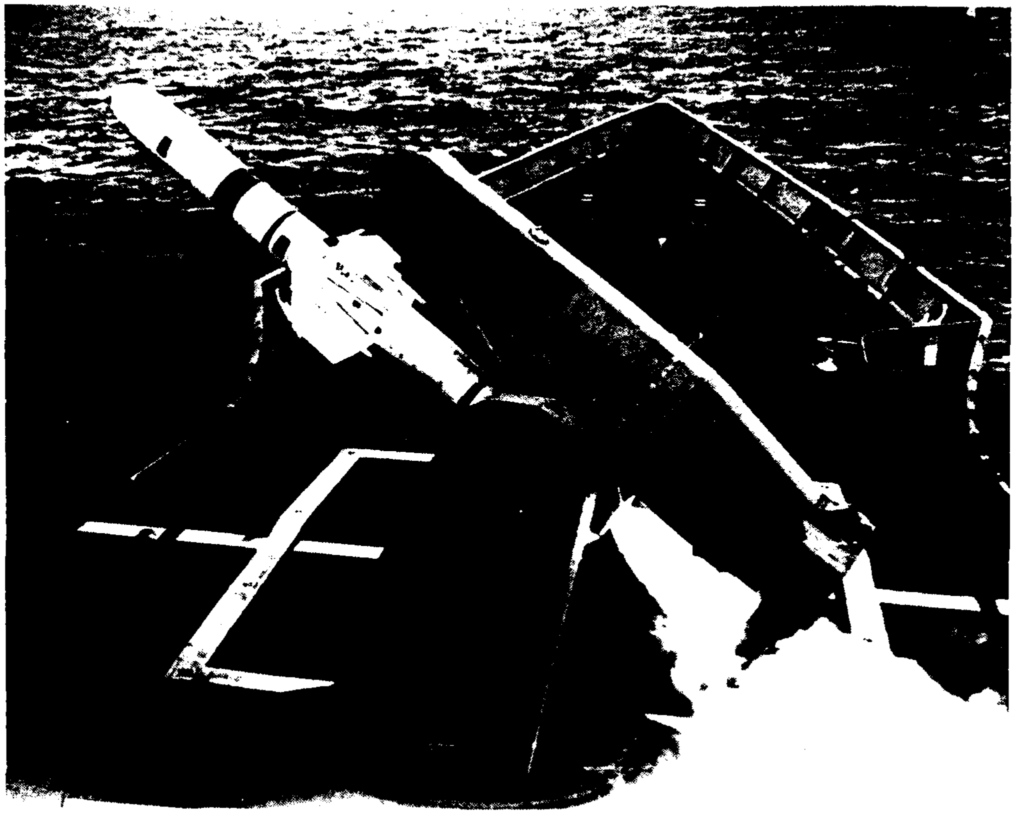
The principal issues to be addressed in the FOT&E of the FY79 combat system are: 1) the capability of the system to provide self-protection and protection of underway replenishment groups, amphibious forces and military shipping against submarine, air and surface threats in single and multi-threat environments; 2) the capability of the system's command, control and communications subsystems to fully sustain the assigned mission areas in independent and coordinated operations; and 3) the capability of the system's electronic warfare subsystem to support the ship's ability to carry out its mission.

OT&E ACTIVITY

Follow-on operational test and evaluation of the FFG-7 FY79 combat system was conducted onboard USS Elrod (FFG-55) from July 1987 to August 1987 in accordance with a DOT&E approved test plan. Prior to approving this test plan, DOT&E required the Navy to update the test and evaluation master plan (TEMP) to appropriately reflect this test. The test was conducted in three phases, two of which were dedicated periods of testing, while the third was done in conjunction with a fleet exercise. A DOT&E staff member observed one entire phase of testing from onboard USS

Elrod. The testing was limited by the fact that the available targets did not fully represent the threat spectrum and the environmental conditions were not representative of all operational areas. Results of the testing are being tabulated and will be reported in our FY88 Annual Report.

HARPOON WEAPON SYSTEM



SYSTEM DESCRIPTION

The Harpoon weapon system is an anti-ship weapon system designed for employment from air, surface and submarine launch platforms. The surface and submarine launched missiles utilize a booster to attain flight speed. All missiles use a turbojet sustainer engine to maintain speed. The Block IC variant of Harpoon has increased tactical flexibility. Each launch platform has a unique combat system, which provides engagement planning, missile initialization and launch control of Harpoon. These platforms also have unique launchers for Harpoon.

BACKGROUND

The Harpoon initial operational evaluations were conducted from 1975 to 1977 on a FF-1052 class ship, P-3 aircraft and an SSN-594 class submarine. Harpoon was evaluated as operationally effective but not operationally suitable due to failure to meet reliability thresholds. After production process improvements and follow-on OT&E, Harpoon was approved for full production in 1981. Between 1977 and 1981, additional OT&E (FOT&E) was

conducted to evaluate the Harpoon cannister launcher, the Harpoon Block I missile seeker improvements, a sea-skim trajectory improvement developed by the United Kingdom and the Harpoon weapon system installed on A-6E aircraft.

In 1983, the Harpoon Block IC missile was operationally tested on various launch platforms and determined to be potentially operationally effective and suitable. In 1985 OT&E was conducted on the cannister launcher configuration of the AN/SWG-1A(V) Harpoon ship command and launch control set and the Harpoon Block IC missile. The AN/SWG-1A(V) is designed to enable surface ships to use all of the Block IC missile capabilities and provide for engagement planning at over-the-horizon ranges. The AN/SWG-1A(V) was recommended for limited fleet introduction.

OT&E ISSUES

The OT&E issues outlined in DOT&E approved test and evaluation master plans (TEMPs) and examined during FY87 operational testing were the operational effectiveness and suitability of the Harpoon Block IC missile and the operational effectiveness and suitability of the MK 13 Tartar launcher and ASROC launcher configurations of the AN/SWG-1A(V) Harpoon ship command and launch control set.

OT&E ASSESSMENT

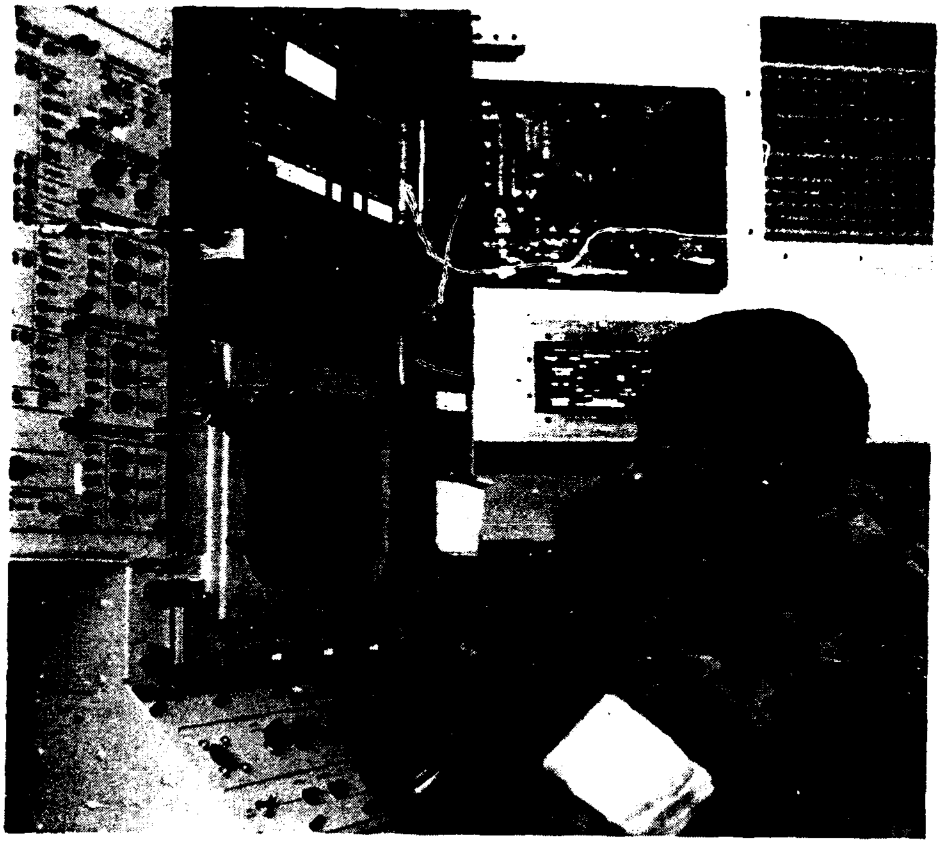
The AN/SWG-1A(V) Harpoon ship command and launch control system was tested in the ASROC launcher variant in USS Stein (FF 1065) and in the Tartar launcher variant in USS Rentz (FFG 46). Testing consisted of three Harpoon Block IC missile launches against hulks or mobile targets and 67 nonfiring engagements against simulated hostile targets. The Harpoon Block IC missile was tested with an engineering development model 3700-4 radar seeker in six firings from submarine, surface and air launch platforms against hulks and mobile targets. Two of these firings were conducted in conjunction with AN/SWG-1A(V) testing. Constraints imposed by safety and asset limits preclude the evaluation of seeker performance in high sea states, in precipitation, against large maneuvering targets and with landmass in the seeker search pattern. These tests were conducted using DOT&E approved test plans, and a DOT&E staff member observed two missile launches while embarked on USS Rente.

The results of testing indicated that when operated by shipboard personnel, the ASROC and Tartar launcher configurations of the AN/SWG-1A were potentially operationally effective in engagement planning, missile preparation and launch control for the Harpoon Block IC missile. The AN/SWG-1A(V) well exceeded reliability and maintainability thresholds. It was recommended for limited fleet introduction after the correction of two safety deficiencies and after the appropriate spare parts were provided. Other significant recommendations for improvement involved safety, training and more flexibility in system operation.

OT&E SUMMARY

It is our view that the OT&E results indicate that the AN/SWG-1A(V) Harpoon Ship Command and Launch Control Set with the ASROC and Tartar launchers has the potential to be operationally effective and suitable.

JOINT TACTICAL COMMUNICATIONS (TRI-TAC)



SYSTEM DESCRIPTION

The TRI-TAC is a major acquisition program, with each Service developing segments of the total required capability. This discussion covers only the AN/TTC-42 Unit Level Circuit Switch (ULCS), which is in a low-rate initial production (LRIP) phase. The AN/TTC-42 is a 150-line central office automatic telephone switch in the family of two ULCS digital secure voice terminal (DSVT) switching equipments for S-280 shelterized field tactical use. SB-3865 is the other ULCS for team transportable 30-line applications. Both were developed by the Marine Corps to replace the current analog switching and terminal equipment for all Services under the TRI-TAC program.

BACKGROUND

The SB-3865 completed testing for a production decision, but reliability and software problems with the AN/TTC-42 resulted in a decision that it was not ready for production. Initial operational test and evaluation (IOT&E) was conducted in 1984 at the Joint Tactical Command, Control, and Communications Agency (JTC3A) Central Test Facility (CTF), Fort Huachuca, Arizona, with other nodes interconnected. Reliability, availability and maintainability (RAM) problems supported a decision to withhold production until corrections could be verified in a limited operational test (LOT-I), which was conducted in 1985 at Fort Huachuca.

Marine Corps decisions were made following LOT-I to approve service use and production of both the SB-3865 and AN/TTC-42, while noting that the Marine Corps Operational Test and Evaluation Activity (MCOTEA) had recommended against approval for the AN/TTC-42, but supported LRIP of the SB-3865. Congressional guidance then limited AN/TTC-42 production to four systems pending completion of first-article testing on the production design. The Marine Corps further decided to conduct a LOT-II on improvements made to existing development systems to provide a basis for assessing the contractor's ability to solve LOT-I problems in a production design. LOT-II test plans were prepared by MCOTEA in December 1986 and that agency issued its Independent Evaluation Report (IER) on 23 June 1987 after completion of LOT-II.

OT&E ISSUES

The objectives of LOT-II were limited in scope and did not address all operational effectiveness and suitability issues, with the primary objectives being to verify correction of previously reported discrepancies and conduct regression testing of software changes. The results were to be used to decide if the AN/TTC-42 should enter production to provide four systems for first-article testing as directed by Congress.

The LOT-II was more a demonstration or development test event than a combat operational scenario or mission event. Network configurations used were similar to those used by the Fleet Marine Force (FMF) and manned by typical FMF communications personnel to increase realism. Limitations included fixed ULCS shelters hard-wired to the JTC3A CTF test node, test sequences more oriented to development test connectivity checks and contractor presence to provide training and technical advice when required concerning maintenance and trouble shooting.

Additional OT&E may be required prior to a full-rate production decision. Any future OT&E should be conducted on LRIP systems after completion of the contractor first article test. Past test and evaluationmaster plan (TEMP) and OT plans were not updated or OSD-approved for LOT-II, but should be reviewed to define and approve any future OT&E of LRIP systems.

OT&E ACTIVITY

LOT-II of the AN/TTC-42 was conducted from 19 February to 27 March 1987 at the JTC3A CTF, Fort Huachuca. The test was conducted by MCOTEA using 36 Marines from the FMF and the Test Support Element, augmented by 3 Army personnel and using TEMP and detailed test plan procedures and criteria approved by the Marine Corps from IOT&E and LOT-I efforts. LOT-II testing was observed by a staff member from this office. MCOTEA reported the results of LOT-II in a 23 June 1987 IER.

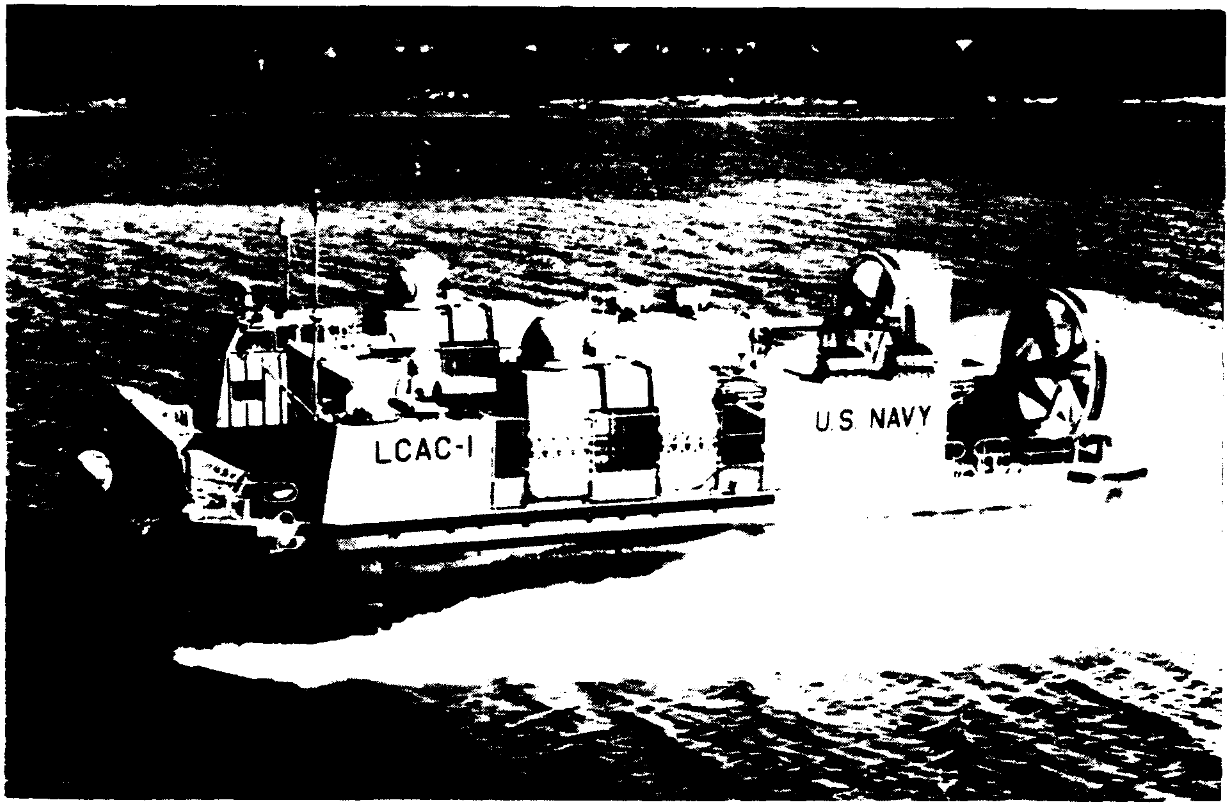
OT&E ASSESSMENT

Of the 57 problems to be investigated, 54 were identified as corrected by the changes incorporated into LOT-II tested AN/TTC-42 systems. Of the 3 uncorrected, MCOTEA assessed none as being critical deficiencies. Of the 10 reliability and maintainability deficiencies previously reported, 3 were evaluated as having been corrected, 1 was partially corrected and 6 showed improvement but failed to meet the criteria. Reliability improved to approximately 1,175 hours mean time between critical failures as compared to the requirement of 1,200 hours. Software performance was satisfactory. Battery fumes were not properly vented from the shelter, causing a safety problem which must be corrected prior to field use. A faulty battery charger in one AN/TTC-42 caused critical power failures on the DC electrical supply, and secure voice capability was lost during a period of high volume live calls. System interoperability testing of AN/TTC-39 and AN/TTC-42 is required to resolve cryptographic synchronization problems for interarea calls. Follow-on operational test and evaluation (FOT&E) should be conducted on LRIP AN/TTC-42 systems in more realistic operational scenarios to include AN/TTC-39 interoperability in secure voice operations. Further testing of the AN/TTC-42 with the AN/TTC-39 will be conducted in accordance with the FYIAP. This is currently scheduled for FY90. A current TEMP and OT plan should be reviewed and approved prior to conduct of any FOT&E.

SUMMARY

LOT-II demonstrated AN/TTC-42 system improvements sufficient to enter LRIP. FOT&E should be conducted on LRIP systems in more realistic combat operational scenarios using criteria from a current and approved TEMP and OT plan.

LANDING CRAFT, AIR CUSHION (LCAC)



SYSTEM DESCRIPTION

The LCAC is a high-speed (greater than 35 knots), fully amphibious landing craft capable of carrying a 60-ton payload. LCAC is capable of traveling over land and water, exposing 70 percent of the world's beaches to amphibious assault, compared to 17 percent with conventional landing craft. LCAC will operate from well deck equipped amphibious ships of the LSD-41, LSD-36, LPD, LHA and LHD classes. The role of LCAC i⁻ to transport, ship-to-shore and across the beach, weapon systems, equipment, cargo and personnel organic to the assault elements of a Marine air/ground task force. The LCAC will embark equipment, troops and/or supplies; launch from a welldeck; transit at high speed to the beach under assault; transit the surf zone and beach; proceed to a suitable offload site; offload rapidly; and return to the amphibious ships for reload and follow-on sorties.

LCACs are assigned to assault craft units (ACUs) specifically formed, equipped, trained and structured to operate LCACs. Smaller detachments of the ACU will deploy aboard amphibious well deck ships with approximately six LCACs. The ACU detachment will have an integral maintenance capability. During missions, maintenance actions are limited to those that can be conducted by the LCAC operating crew while underway or by the ACU detachment during loading periods between sorties aboard designated amphibious ships. The ACU detachment performs both corrective and preventive maintenance.

BACKGROUND

During an operational test period in February 1985 the first production LCAC demonstrated speed and load carrying capability well in excess of required thresholds, but experienced 35 major or critical failures, which caused this system to be assessed not operationally suitable. Deficiencies included gearbox failures, drive shaft failures, radar failures and bow thruster malfunctions. Corrections for these and other failures were engineered and installed in the first two low rate initial production (LRIP) craft between November 1985 and April 1986.

The first FY86 phase of LCAC testing was conducted 3-9 May 1986. A total of 15 single LCAC assault scenario missions were conducted in the Gulf of Mexico and ashore on barrier islands adjacent to Eglin AFB, Florida. Assault missions included load-out with Marine equipment aboard USS Whidbey Island (LSD-41), a 24-nautical-mile transit to the beach and overland movement to a designated unloading area. Additional testing was recommended by Commander, Operational Test and Evaluation Force (COMOPTEVFOR), a recommendation with which this office agreed.

A second phase of LCAC testing was conducted 10-20 June 1986, after correction of deficiencies and an intensive period of operations designed to accumulate operating hours on the test craft. Test operations were conducted at the Naval Coastal Systems Center, Panama City Florida and the sea islands adjacent to Tyndall AFB, Florida. The craft was placed in deficiency status after four missions because of failures of the longitudinal stability bag and bow thrusters. After repairs were made, the craft was recertified ready for testing, and 10 single LCAC assault scenario missions were conducted. Although there was a recurrence of reliability problems such as windshield wiper motor failures, hydraulic leaks and spurious alarms, LCAC performance during this test period demonstrated that the system has the potential to be operationally suitable, and further limited production was recommended. The DOT&E recommended that the limited production rate be held to a minimum until further operational testing to address outstanding critical operational issues had been successfully conducted.

OT&E ISSUES

Follow-on operational testing (OT-IIIB) addressed 18 critical operational issues: support ship operations, performance, vulnerability, Marine Corps equipment, survivability, support systems performance, command and control, coordinated operations, reliability, maintainability, availability, interoperability, compatibility, logistic supportability, human factors, safety, training and technical documentation. Amphibious assault missions were modeled after the basic assault scenario in the Chief of Naval Operations top level requirements (TLR) document for LCAC. Marine Corps equipment representative of actual amphibious assault serials was carried during operations.

OT&E ACTIVITY

FOT&E (OT-IIIB) was conducted with two LCACs 7-16 April 1987 on board USS Germantown (LSD-42) at San Nicolas Island, Pacific Missile Test Center, in the Southern California Operating Area, and at Camp Pendleton, California. Test plans for the final phase were approved by this office, and a member of the DOT&E staff observed the conduct of the test aboard the USS Germantown for five days.

The FOT&E was a test of production representative hardware operated and maintained by representative operational personnel under conditions simulating amphibious assault operations against a secure beach.

OT&E ASSESSMENT

It was our judgement that, as tested, LCAC demonstrated an operationally effective capability and met survivability requirements of the TLR. However, LCAC has not been tested under the full range of expected environmental conditions. LCAC is generally suitable for use, except for shipboard spare parts deficiencies, excessive spurious alarms on the monitoring displays and the faulty windshield wiper system (critical for safe operations), all of which should be corrected as soon as possible. As had been previously reported, LCAC is vulnerable to hostile fire from a lightly armed force. The degree of LCAC vulnerability depends upon scenario and availability of other forces for defense suppression. An expanded discussion of vulnerability issues is included in our classified beyond-LRIP report to Congress and the Secretary of Defense, dated 12 June 1987.

SUMMARY

LCAC OT&E was adequate to provide the information necessary prior to a production decision. Recent testing has shown that basic engineering problems are in hand and that LCAC is operationally suitable and effective. Corrections to the remaining minor reliability issues have been recommended. The testing was conducted in as realistic an environment as could be achieved within constraints on the availability of test sites. In view of the test results, the Navy plans to procure production quantities of the LCAC. FOT&E is scheduled in FY88 to assess LCAC force vulnerability during approach to the assault beachhead and after the force moves inland. The effectiveness of multiple LCAC operations and correction of remaining reliability deficiencies will be validated by further OT&E early in FY89.

LIGHT AIRBORNE MULTI-PURPOSE SYSTEM (LAMPS) MK III

SYSTEM DESCRIPTION

The Light Airborne Multi-Purpose System (LAMPS) MK III is a computer integrated ship/helicopter system designed to increase the effectiveness of surface combatants. It uses the SH-60B Seahawk helicopter, which carries sonobouys, torpedoes, acoustic processors and magnetic anomaly detection (MAD) equipment for its primary mission of anti-submarine warfare (ASW). The various classes of ships which employ LAMPS MK III (DD-963, DDG-993, FFG-7, CG-47, DDG-51) provide additional sensor processing, command and control, landing and traversing systems and maintenance and support facilities, as well as integrating LAMPS information with other sensor data. LAMPS MK III secondary missions include anti-ship surveillance and targeting (ASST), search and rescue, medical evacuation, vertical replenishment, communications relay, logistics support and naval gunfire support.

BACKGROUND

The LAMPS program was initiated in 1969 based on a Chief of Naval Operations requirement for a manned helicopter to operate from destroyer-class ships to enhance their anti-submarine warfare and anti-ship surveillance and targeting capabilities. The LAMPS MK I was the initial result of this requirement, with the LAMPS MK III being the follow-on version.

The LAMPS MK III validation phase was completed in December 1976, and the first flight of the SH-60B was conducted in December 1979. A full-scale development model was used for operational evaluation (OPEVAL) in the stand-alone mode aboard USS McInerney (FFG-8) from May 1981 through February 1982. The LAMPS MK III was determined to be potentially operationally effective and potentially operationally suitable. Provisional approval for Service use was granted in September 1981, and the first production aircraft was delivered in September 1983. Follow-on operational test and evaluation (OT-IIIA/B) resulted in a Commander, Operational Test and Evaluation Force (COMOPTEVFOR) conclusion that the LAMPS MK III was potentially operationally effective and operationally suitable, with a recommendation for limited fleet introduction. Open-ocean ASW effectiveness could not be determined due to cancellation of such testing. As a prerequisite to approval for full fleet introduction, COMOPTEVFOR recommended further follow-on operational test and evaluation (OT-IIIC) be conducted.

OT&E ISSUES

Operational effectiveness issues examined in OT-IIIC include: 1) determination of open ocean ASW effectiveness; 2) determination of ALQ-142/SLQ-32 system capability against threat representative emitters; 3) assessment of the impact of a hostile radio frequency (RF) environment; 4) determination of the capability of the SH-60B to conduct naval gunfire support, medical evacuation, search and rescue, logistics support, vertical replenishment and communications relay; and 5) assessment of SH-60B survivability and vulnerability.

OT&E ASSESSMENT

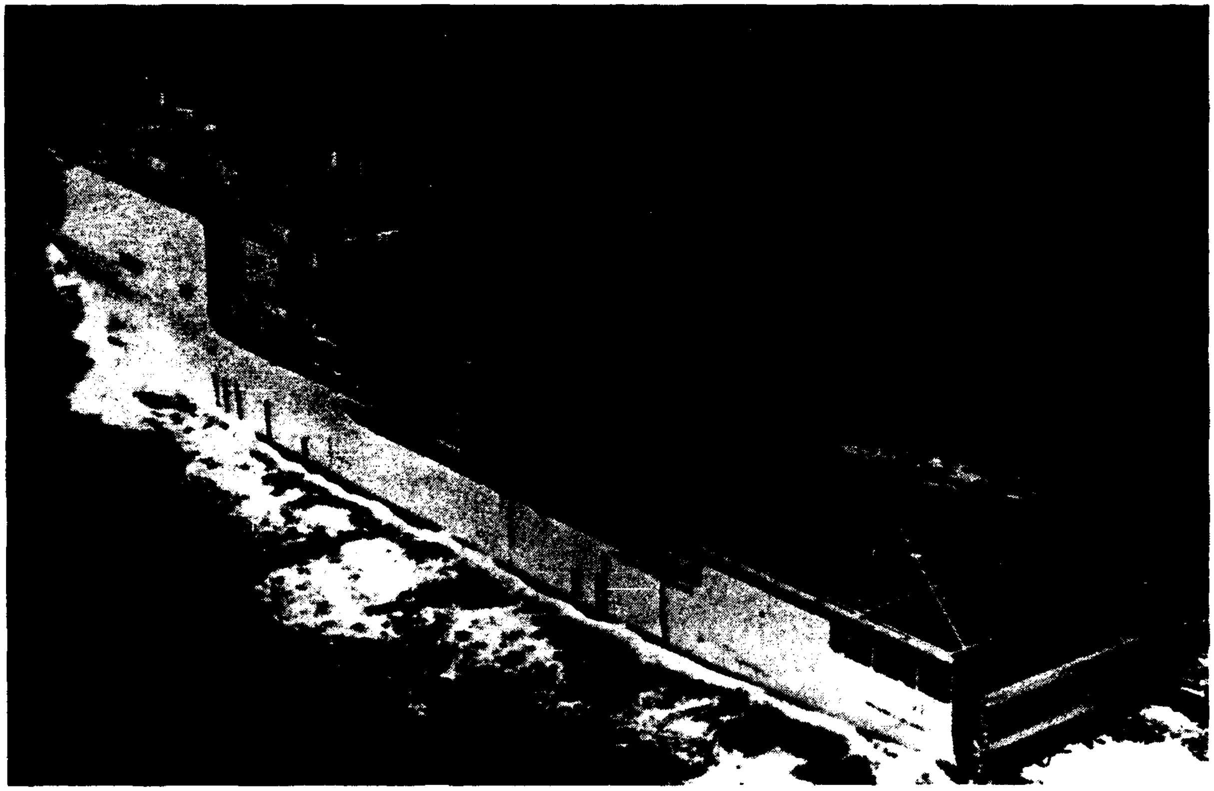
OT-IIIC of the LAMPS MK III was conducted onboard USS Elrod (FFG-55) from July 1987 to August 1987, in accordance with a DOT&E approved test plan. Prior to approving this test plan, DOT&E approved an update to the test and evaluation master plan (TEMP). This was the first time this TEMP had been submitted to OSD for approval. Earlier versions of the TEMP had been approved within the Department of the Navy. The purpose of the test was to verify correction of deficiencies noted during earlier OT&E and to resolve outstanding OT&E issues to support a recommendation concerning full fleet introduction. The test was limited in that the equipment on USS Elrod is not the same as that proposed for other ship classes, and therefore, an assessment of LAMPS MK III capabilities when integrated with the CG-47, DD-963 and DDG-993 class ships could not be made.

The testing was conducted at instrumented ASW EW ranges, as well as during a fleet exercise. The LAMPS MK III demonstrated operational effectiveness and suitability in its primary mission of anti-submarine warfare. It also demonstrated the capability to conduct anti-ship surveillance and targeting, naval gunfire support, medical evacuation, search and rescue, logistics support, and communications relay. A DOT&E staff member observed part of this testing from onboard USS Elrod.

SUMMARY

In our view, this testing showed LAMPS MK III to be operationally effective and suitable. Full fleet introduction was recommended by COMOPTEVFOR after correction of one deficiency.

LSD-41 AMPHIBIOUS ASSAULT SHIP



SYSTEM DESCRIPTION

The LSD-41 amphibious assault ship is part of the program to provide increased amphibious lift capacity from over-the-horizon launch points. It is designed to be capable of carrying, launching and supporting four air-cushion landing craft or an equivalent mix of other landing craft. The LSD-41 weapons suite will consist of two Phalanx Close-in Weapon Systems (CIWS), two 20mm guns, Super Rapid Blooming Offboard Chaff System, and an electronic warfare system. The main propulsion system consists of four high-powered, medium-speed diesel engines driving two controllable-pitch propellors.

OT&E ISSUES

The OT&E issues associated with the LSD-41 class included propulsion system performance, LCAC interface systems, bridge crane operation, and emergency recovery of LCACs. In addition, all suitability issues were examined. Since the LSD-41 is a repeat design of the LSD-36 class, a full-ship OT&E was not conducted.

OT&E ACTIVITY

During August-September 1985, operational testing of the LSD-41 was conducted on the first ship of the class, USS Whidbey Island (LSD-41). Ten days of operational testing were conducted in conjunction with USS Whidbey Island contract trials and development testing of the LCAC. Due to technical difficulties with the LCAC, testing was suspended. No critical problems were identified with the LSD-41 during this period.

Further operational testing (OT-IIIB) was conducted at sea aboard the USS Germantown (LSD-42) during April 1987 concurrently with LCAC OT-IIIB. The test plan was approved by this office, and testing was witnessed by DOT&E staff aboard ship. The test objectives focused on the operational effectiveness and suitability of the propulsion system, the welldeck bridge crane, capability to support LCAC operations (including emergency recovery), and the adequacy of the training of personnel. In addition, self-noise was evaluated to determine if propulsion system noise increases ship/task force vulnerability.

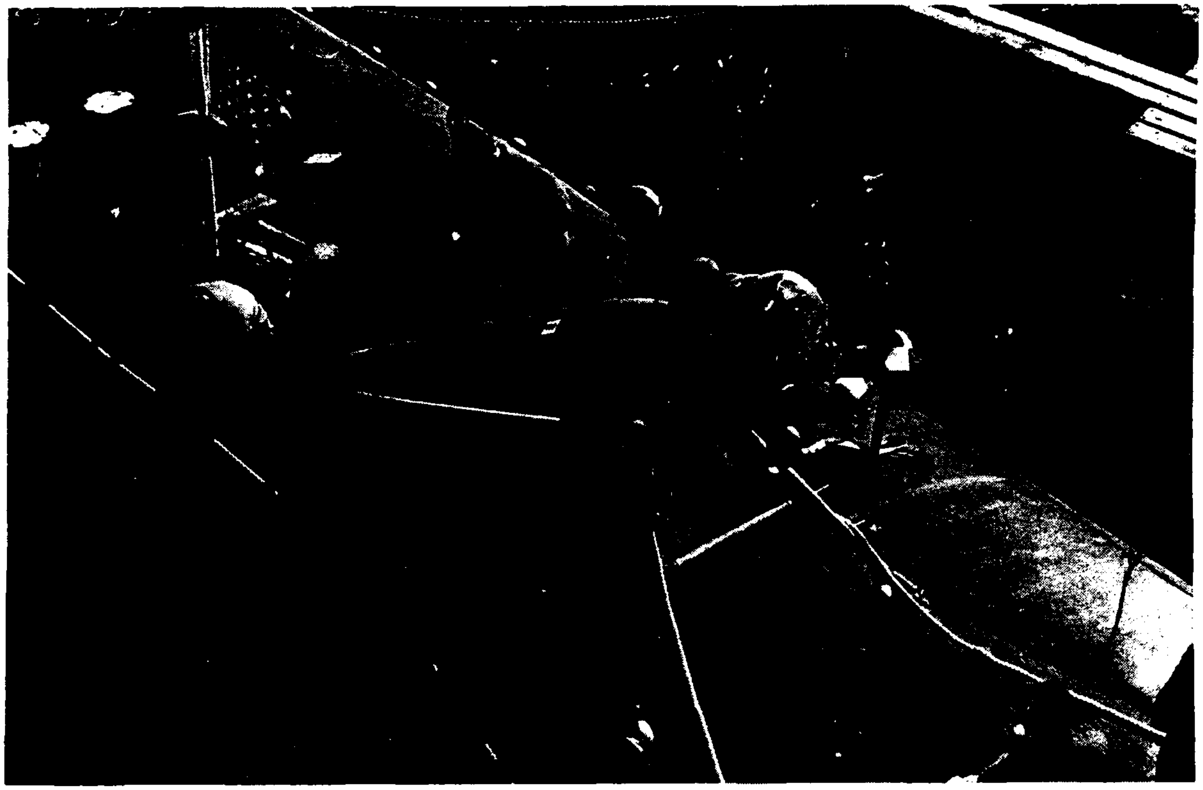
OT&E ASSESSMENT

It is our view that the res lts of OT-III support a recommendation for full fleet introduction of the LSD-41 class ship after accomplishing the following: correction of the cause of piston/cylinder liner seizure failures; installation of "Inogon" line-up lights in the welldeck (temporarily installed for OT-III); and correction of volume levels of internal communication circuits.

SUMMARY

The LSD-41 class ship designated systems and LCAC interface and support systems were found to be operationally effective and suitable, and LCAC successfully demonstrated the capability of entering, exiting and movement in the welldeck.

MK-48 ADVANCED CAPABILITY (ADCAP) TORPEDO



SYSTEM DESCRIPTION

The MK-48 advanced capability (ADCAP) torpedo is a submarine-launched anti-submarine warfare (ASW) and anti-surface warfare (ASUW) wire-guided and acoustic homing torpedo. It is an upgrade to the existing MK-48 heavyweight torpedo, which replaces the guidance and control system with an all-digital, computer-based system, upgrades propulsion for increased speed and depth and improves the warhead sensor for ASUW. The MK-48 ADCAP should provide significantly improved tactical flexibility through greater endurance, shorter preset, warm-up and reactivation times, improved salvo operation, greater launch-ship protection and shorter minimum effective launch ranges than the MK-48 torpedo it will replace.

BACKGROUND

The MK-48 ADCAP was developed to maintain weapon effectiveness against high-performance nuclear submarines and surface ships and counter advances in threat submarine capabilities. The program entered the demonstration and validation phase in FY79 and full-scale development in FY82. In FY84 early operational test and evaluation (OT&E) was conducted concurrently with development testing on an advanced development model torpedo. The OT&E supported initial procurement of long-lead materials, tooling and test equipment. Results of an operational assessment in FY85 supported funding for fabrication of the initial pilot production torpedoes. Both the FY84 and FY85 operational test/assessment reports made recommendations to enhance weapon performance. In January 1985 the DOT&E designated the MK-48 ADCAP as a DOT&E oversight program, and in December 1985 it began coverage through the Selected Acquisition Report review process.

The FY87 initial OT&E was conducted to provide information for a decision to commence low-rate initial production (LRIP). Operational tests are planned for FY88 to support full production, and this office will report its assessment to Congress and the Secretary of Defense before the decision is taken.

OT&E ISSUES

Operational testing during FY87 continued to examine the operational effectiveness and suitability of the MK-48 ADCAP in attacking submarines and surface ships. The principal OT&E issues addressed were the ability of the launching submarine to detect, classify and localize the target for weapon placement, the ability of the torpedo to attack maneuvering and non-maneuvering targets and a full range of operational suitability issues. These issues are detailed in the DOT&E approved test and evaluation master plan (TEMP).

OT&E ASSESSMENT

MK-48 ADCAP operational testing was conducted in two phases during FY87. The test plan was approved by DOT&E only for the early IOT&E conducted during FY87. It was not considered adequate to support the OT&E leading to a full-production decision because the scenarios did not provide a sufficiently stressful threat. The Navy modified those scenarios, and we subsequently approved the test plan to support FY88 OT&E. From September to November 1986, 15 torpedoes were fired, and several deficiencies were identified. After correction of these deficiencies the operational tests were resumed in May 1987.

The second phase of operational testing consisted of 24 firings conducted jointly with the program office as combined development testing/operational testing (DT/OT) and 48 firings conducted as independent operational tests. Fourteen of these firings were observed by DOT&E staff. Test firings against submarines, surface ships and mobile targets were conducted from two

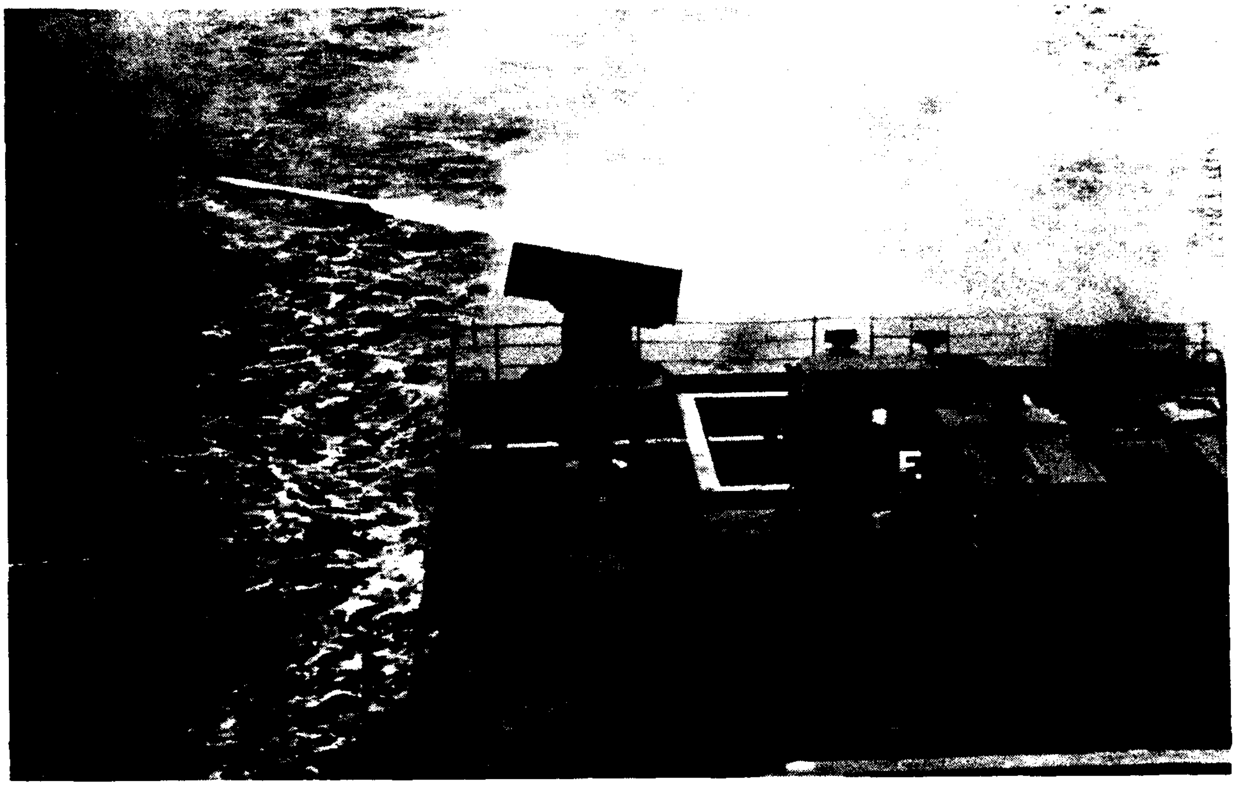
different launching submarines at the Atlantic Undersea Test Center (AUTEC) and Atlantic Fleet Weapons Test Facility (ATWTF). The operational tests were limited by the restrictions on target submarines, lack of warhead electronics data and a sinkable target to assess warhead performance.

The launching submarines demonstrated a satisfactory capability to detect and classify targets, although the constraints of a range and test environment provide a higher degree of alertness than would be expected in a long-term operational environment. The launching submarines also demonstrated satisfactory weapon placement. The MK-48 ADCAP torpedo turnaround and corrective times exceeded thresholds, but on-board availability was 1.0. A number of shipboard fire control performance and human factor deficiencies were identified, including invalid torpedo settings displayed, a requirement for manual calculations and incorrect target displays.

OT&E SUMMARY

It is our view that the MK-48 ADCAP has demonstrated a target acquisition and homing capability with the potential to meet ASW and ASUW hit criteria and demonstrated significant improvement over the in-service MK-48 torpedo. The MK-48 ADCAP has demonstrated the potential to be operationally effective and suitable.

ROLLING AIRFRAME MISSILE WEAPON SYSTEM



SYSTEM DESCRIPTION

The rolling airframe missile (RAM) weapon system program is designed to provide surface ships with an effective, low-cost, lightweight, self-defense system which will provide an improved capability to engage and defeat incoming anti-ship missiles that penetrate outer area defense systems. The XRIM-116A missile is a five-inch diameter rolling airframe missile employing a dual mode passive radio frequency/infrared (RF/IR) seeker to home on anti-ship missile active seekers or radiated heat. The rocket motor, warhead and fuse are the same as used in the Sidewinder missile. The missile will be deployed from a dedicated launcher. The RAM combat direction system employs the existing MK 23 target acquisition system (TAS) radar and the AN/SLQ-32 electronic warfare support sensor together with the new threat evaluation and weapons assignment (TEWA) software resident in the MK 23 TAS to accomplish detection, correlation, evaluation, and weapon assignment.

BACKGROUND

In May 1975, the Chief of Naval Operations established an operational requirement for the RAM weapon system, and in February 1977 an advance development (AD) contract was awarded. As a result of independent threat analysis, the Federal Republic of Germany (FRG) developed a requirement similar to that of the United States. In July 1976, the FRG and the U.S. signed a memorandum of understanding (MOU) for joint participation in the AD phase of the RAM weapon system program. A MOU for the full-scale engineering development (FSED) of the RAM missile was signed in spring 1979 by the U.S., FRG, and the Kingdom of Denmark (DK). Developmental testing began in 1980, and initial operational test and evaluation (IOT&E) was conducted from December 1986 through February 1987.

The 1987 Department of Defense Authorization Act required the Secretary of Defense to certify in writing to the Committees on Armed Services of the Senate and House of Representatives, no later than 31 March 1987, that certain RAM development and production related thresholds had been met. One of the certification items was that DOT&E approve the test and evaluation master plan (TEMP). Initial DOT&E review of the TEMP identified several issues affecting the operational realism of the proposed tests. After satisfactory resolution of these issues by the Navy, the TEMP was approved on 6 March 1987. One issue of major concern was the lack of adequate facilities for testing shipboard self defense weapons systems. The nature of these systems, including RAM, is such that the most realistic testing requires flying targets almost directly at the system. For personnel safety reasons, this cannot be done against manned test sites. DOT&E encouraged the Navy to develop a self-defense test site (SDTS) that would allow this type of testing. In close coordination with DOT&E, the Navy has completed a study and plans to request funding in FY90 for a SDTS to be constructed on a decommissioned ship. This test facility will be available for FOT&E on RAM and earlier testing on future systems.

OT&E ISSUES

The principal OT&E issues examined during the FY87 IOT&E include: 1) the capability of ship active/passive sensors to detect air threats; 2) the capability of the RAM combat direction system to correlate sensor information, evaluate threats and direct engagements; 3) the capability of the RAM weapon system to counter single and multiple threats, including late turn-on and low-power emitting threats; 4) the capability of the RAM weapon system to operate under all natural environmental conditions encountered; and 5) the capability of the RAM weapon system to operate in adverse infrared and electromagnetic conditions.

OT&E ASSESSMENT

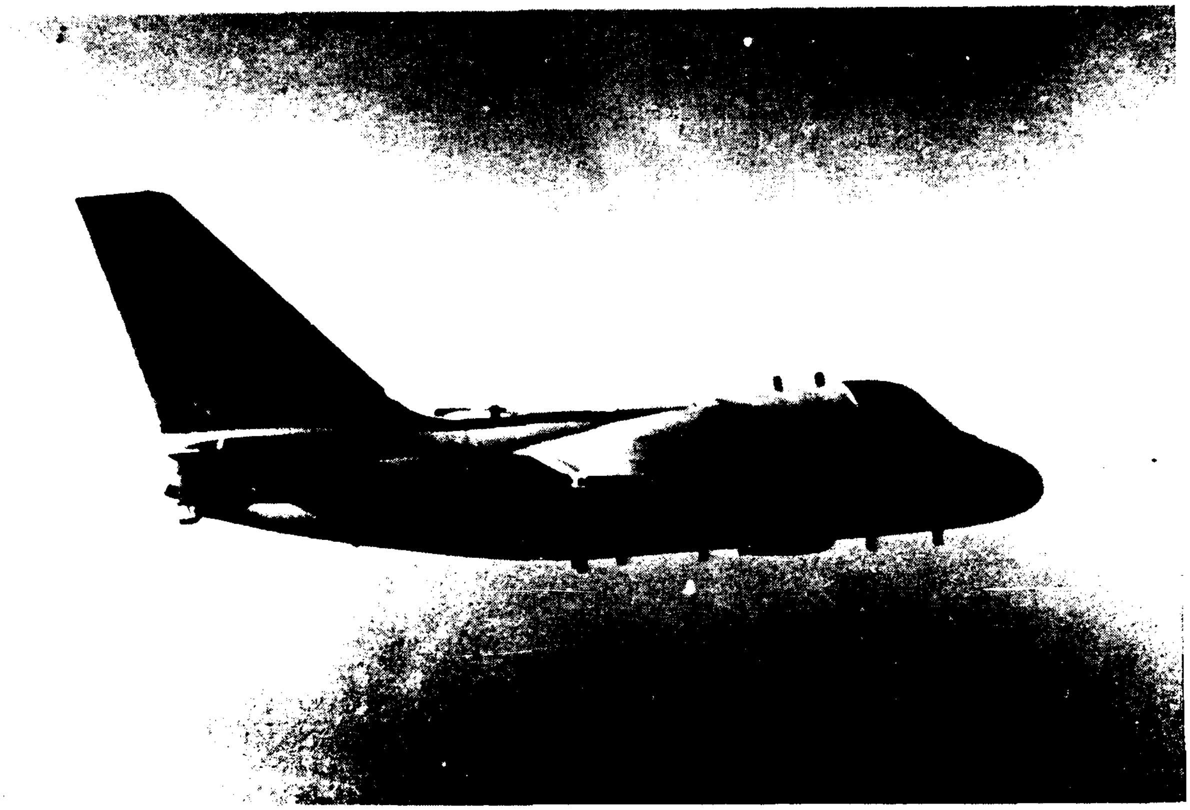
Early operational test and evaluation (OT&E) of the rolling airframe missile (RAM) was conducted in conjunction with developmental testing from December 1986 to February 1987. System-level testing which included target detection, correlation, evaluation, engagement and missile launch was conducted at White Sands Missile Range, New Mexico, and onboard USS David R. Ray (DD-971) in accordance with a test plan approved by DOT&E. Part of the testing was observed by a DOT&E staff member. These tests consisted of 30 non-firing tests and seven firing tests. Six additional missile firings were conducted without the support of the full weapon system.

Test limitations included testing against supersonic targets limited to missile-only engagements because safety considerations precluded engagements from manned sites and no unmanned facility existed to test system-level engagements; subsonic BQM-34S and supersonic MQM-8G (Vandal) targets did not fully simulate the characteristics of the threat; effects of countermeasures were not assessed; and testing was limited to low-density target environments that were not fully representative of the threat.

SUMMARY

It is the view of this office that the operational effectiveness and suitability demonstrated during this test was adequate to support a recommendation for limited production. Further operational testing will be conducted and assessed prior to a full-production decision.

S-3 WEAPON SYSTEM IMPROVEMENT PROGRAM (WSIP)



SYSTEM DESCRIPTION

The S-3A WSIP is designed to upgrade the carrier-based S-3 weapon system to better perform the sea control mission against more capable threats. The new system, designated S-3B, includes a new acoustic processor, a 99-channel sonobouy receiver and a new acoustic tape recorder for improved anti-submarine warfare (ASW) capability in the outer ASW zone. The radar system was redesigned to provide an inverse synthetic aperature radar (ISAR) capability, which allows the classification of surface ships. The electronic support measures (ESM) system was modified to increase its ability to detect and classify threat emitters. These improvements provide a more capable surface, subsurface and surveillance coordination (SSSC) capability which, when combined with the Harpoon missile added as part of the WSIP, provides the S-3B with stand-off surface attack capability. The S-3B was also provided with a defensive capability through the addition of electronic countermeasures (ECM) dispensers for chaff, flares and jammers. The future command and control capability of the S-3B will be further enhanced through the WSIP reservation of space and weight for the global positioning system (GPS) and joint tactical information distribution system (JTIDS).

BACKGROUND

During FY85 the S-3B underwent operational testing (OT-IIA) to assess potential operational effectiveness and suitability. In FY86, OT-IIB was conducted using two full-scale engineering development aircraft. The initial performance of several subsystems (radar, ECM, and Harpoon) was excellent. However, deficiencies in the system software and the maintainability of the aircraft rendered the S-3B system not sufficiently operationally suitable, and Commander, Operational Test and Evaluation Force (COMOPTEVFOR) placed the S-3B in deficiency status on 19 September 1986.

OT&E ACTIVITY

Developmental testing to correct the noted deficiencies has continued, but there was no operational testing in FY87. COMOPTEVFOR will resume testing in FY88 following correction of the identified deficiencies and recertification that the S-3B is ready for operational testing.

SUMMARY

As a result of the efforts of this office, the Navy decided to restructure its procurement plan for S-3A improvement program (S-3B) kits and remain in low-rate initial production (LRIP) until the system has satisfactorily completed adequate OT&E. (The original program schedule called for full production in FY87.) Although this program has significant potential, software and maintainability problems reported in our FY86 Annual Report have prevented a successful operational evaluation. Therefore, we concluded that it was not prudent to start full production until corrections could be made and verified by OT&E assessed by this office.

MARINE CORPS

TACTICAL AIR OPERATIONS CENTER/ MODULAR CONTROL EQUIPMENT (TAOC/MCE)

SYSTEM DESCRIPTION

The tactical air operations center/modular control equipment (TAOC/MCE) program is not a major defense acquisition program, but was designated for DOT&E oversight in accordance with 10 USC 138. The program is in the low-rate initial production (LRIP) phase. Tactical air operations modules (TAOMs) or operations modules (OMs), nomenclatured AN/TYQ-23(V), are the primary equipment developed in this program. These modules are used as automated air command and control system building blocks in varying combinations to replace the currently deployed Marine Corps tactical air operations central (TAOC) and tactical data communications central (TDCC), collectively known as the Marine Tactical Data System (MTDS), and the Air Force control and reporting center (CRC)/ control and reporting post (CRP) and forward air control post (FACP) systems known as 407L and 485L. TAOC/MCE systems are packaged in 8x8x20 foot transportable military shelters (TAOMs orOMs) to provide ground-based automated air surveillance and command and control capability. Tailoring of the system capacity is achieved by the use of one or more of the modules. Up to five modules are to be interconnected

with fiber optic cables at lengths to allow dispersion for tactical or other considerations. All mission essential equipments are internal to the module except the separate radars, identification friend or foe (IFF) equipment, and prime power sources. Shelter design is to allow the transport of a module by fixed or rotary wing aircraft, ship, rail, mobilizer or truck. On-and off-loading is to be accomplished by crane, container transporter or fork lift.

BACKGROUND

TAOC/MCE is a multi-Service program. Acquisition is conducted by the Marine Corps under a Navy contract. The Navy initiated development in 1978 and the Air Force entered the program in 1982. A full-scale development system was tested from June 1986 to January 1987. Four modules were tested by Marine Air Control Squadron One (MACS-1) at Camp Pendleton, California, and one module was tested at Hurlburt Field, Eglin Air Force Base, Florida. A single module was transported by C-141 from Camp Pendleton to Hurlburt Field for interoperability testing. Results of initial operational test and evaluation (IOT&E) provided information for separate Service LRIP decisions and award of the contract in May 1987. The Services plan various future improvements to the system to add separately developed system enhancements and other mission essential preplanned product improvements (P3I) such as jam-resistant communications.

OT&E ISSUES

Different issues are applied by the Marine Corps and the Air Force. Marine Corps issues include the capability to increase system mobility and modular capability, reduce mission reaction time and increase system capacity, improve commonality among modules, enhance "graceful degradation," and possess the capacity to fully exploit the capabilities of new sensors, communications systems and weapons during the system's lifetime. Air Force issues include the capability to function as elements of the ground tactical air control system (TACS), sustain operations in TACS despite reconfiguration or losses due to hostile action, be deployed and redeployed in the tactical environment, interoperate with other command and control facilities and systems, support mission essential P3I, and support sustained operations within the maintenance concept. Limited assets did not allow full configuration testing by the Air Force, which observed and used Marine Corps results wherever practical.

Follow-on operational test and evaluation (FOT&E) is required to demonstrate corrections to problems noted during IOT&E, provide information for full-rate production decision and ensure integrated capability of the fully P3I configured system. These issues have yet to be coordinated into a test and evaluation master plan (TEMP) and an operational test (OT) plan for approval by OSD.

OT&E ACTIVITY

IOT&E of TAOC/MCE began in June 1986 and continued through January 1987. Marine Corps testing was conducted in three phases. Phase 1 including setup/packup of OMs, training of MCAS-1 augmentee personnel, and system checkout. Phase 2 consisting of eight weeks of operational scenarios, including data link with F-4 and F-18 aircraft, embarking and operation aboard ship, landing across the beach, and interface/ inter- operability with existing Navy and Marine Corps command and operations centers including participation in Exercise Kernel Blitz 86-2. Phase 3 entailed dual TAOC operation establishing a two-site capability with data link and remote radar operations.

Air Force testing was conducted in four phases. Phase 1 consisted of observing activities at MACS-1. Phase 2 involved single OM testing at Hurlburt Field to evaluate the concept of modular replacement of the existing FACP and CRC/CRPs with automated systems. Phase 3 was testing of interoperability between a single Air Force OM and a Marine Corps TAOM which was transported from Camp Pendleton to Hurlburt Field after completion of testing by MACS-1. Phase 4 included conversion of the Marine Corps TAOM to an Air Force OM configuration followed by two-OM testing.

The Marine Corps Operational Test and Evaluation Activity (MCOTEA) participated in testing of the TAOM and prepared an independent evaluation report (IER) dated 4 December 1986. The Air Force Operational Test and Evaluation Center (AFOTEC) conducted testing of the MCE and issued two reports, a preliminary report on 17 November 1986 and a final report dated April 1987. Testing was observed by representatives of this office.

OT&E ASSESSMENT

TAOM/MCE is assessed as operationally effective and capable of carrying out its mission. It is estimated that fielding of the system can be expected to increase operational effectiveness over the systems being replaced. A limited operational capability can be established with only one module. Setup and initialization times are approximately eight times faster. Air surveillance, weapon control and air traffic control functions along with the operator console capability are improvements over current systems. Primary constraints that periodically limit operational effectiveness are limitations in the TAOM automatic handling of high density radar target inputs that occurs when the interconnected radars are operating in an automatic acquisition mode, periodic critical loss of communications capability due to failures of the communications interface unit (CIU) or the fiber optic interface panel, delays in keying for voice communications, software maturity and durability of cables and connectors.

Systems operational suitability is marginal. Improvements are required in reliability, technical manuals and data and supportability of software and firmware. Transportability was not rated by the Air Force due to the lack of a production representative mobilizer and the approved tractor-trailer combination.

A thorough FOT&E is required to demonstrate corrections of problems noted during IOT&E, provide information for a full-rate production decision and ensure integrated capability of the fully P3I configured systems. A TEMP and an OT plan are required for OSD approval.

TOMAHAWK WEAPON SYSTEM

SYSTEM DESCRIPTION

The Tomahawk weapon system is a long-range cruise missile system designed to be launched from submarines and surface ships against land targets and ships. There are four missile variants: anti-ship (TASM); nuclear land attack (TLAM-N); conventional land attack (TLAM-C); and conventional land attack, submunition (TLAM-D). Each is contained within a pressurized canister to form an all-up-round. The submarine all-up-round is launched from torpedo tubes or vertical tubes located in the nonpressure hull area. The surface ship all-up-round is launched from an armored box launcher or the MK 41 vertical launching system (VLS). Both submarines and surface ships have combat/weapons control systems to perform engagement planning, missile initialization and launch control functions. Targeting for Tomahawk is supported by the theater mission planning system (which provides the land targets and overland missile navigation update information) and the over-the-horizon detection, classification and targeting system, (which provides ship targets and contact avoidance information).

BACKGROUND

Development of the sea-launched cruise missile began in 1972 with full-scale engineering development starting in 1977. Initial operational test and evaluation (IOT&E) began in 1981. OT&E of each Tomahawk missile variant and the various associated weapons systems has been preceded by a combined developmental test/operational test (DT/OT) to minimize the expenditure of test resources while achieving both technical and operational test objectives.

OT&E of the TASM and TLAM-N missile variants from both submarines and surface ships was sufficiently complete in 1984 that in November of that year the DOT&E submitted to Congress the beyond low-rate initial production (LRIP) report required by 10 USC 138. Subsequently, the decision was taken to increase production rates of the TASM and TLAM-N beyond the LRIP level. A similar report for TLAM-C was submitted by the DOT&E in December 1985. OT&E of new missile variants, missile improvements, and new launching and weapons control systems is a continuing process.

OT&E ISSUES

A large amount of Tomahawk operational testing, some of which has been in progress for several years, was completed during FY 87. All OT&E was conducted in accordance with a DOT&E approved test plan. A DOT&E staff member observed firings of TLAM-C, TASM and TLAM-N weapons during this reporting period. These tests and their major OT&E issues were as follows:

o An early phase of OT&E on the SSN-688 class submarine Tomahawk vertical launch system (VLS) was conducted to assess potential operational effectiveness and suitability (including its ability to stow and launch missiles), and the effects of installation on the SSN-688

o Follow-on operational test and evaluation (FOT&E) was conducted on the MK 36 Tomahawk weapons system (TWS) to evaluate the operational effectiveness and operational suitability of the Block 1 upgrade to this system. The MK 36 TWS uses the armored box launcher (ABL).

o FOT&E was conducted on the submarine and ship launched nuclear land attack Tomahawk weapons system to verify correction of previously identified deficiencies and support a recommendation regarding full production.

o FOT&E was conducted on the land attack Tomahawk weapons system theater mission planning center (TMPC) to determine the operational effectiveness and operational suitability of the TMPC with Block 8.0 software.

o FOT&E was conducted on the submarine and ship launched anti-ship Tomahawk weapons system to verify the correction of previously identified deficiencies and support a recommendation regarding full production.

o FOT&E was conducted on the submarine and ship launched conventional land attack Tomahawk weapons system to verify the correction of previously identified deficiencies and support a recommendation regarding full production.

OT&E ASSESSMENT

Initial operational testing of the SSN-688 class vertical launch system (VLS) consisted of operations to determine VLS impact on submarine operating characteristics, all-up-round loading operations, and a launch of a TASM missile from the USS Pittsburgh (SSN-720). The OT&E was limited by the single-missile launch and the early stage of system development, which required a stand-alone firing system operated by contractor personnel. Although the OT&E identified a number of deficiencies for correction, the VLS demonstrated potential to be operationally effective and suitable.

Follow-on operational testing of the MK 36 Tomahawk weapons system (TWS) with Block 1 upgrade was conducted on USS Arkansas (CGN-41) from 31 March to 2 April 1987. It was determined that software changes were required, and testing was suspended. Testing was resumed on USS Deyo (DD-989) in July 1987 using upgraded software. There were no limitations to the scope of this testing. The MK 36 TWS with Block 1 upgrade demonstrated sufficient operational effectiveness and suitability to support a recommendation by Commander Operational Test and Evaluation Force (COMOPTEVFOR) for full production and full fleet introduction.

Follow-on operational testing on the submarine and ship launched nuclear land attack Tomahawk weapon system (TLAM-N) was conducted from April 1985 to July 1987. Full fleet introduction was recommended by COMOPTEVFOR following correction of deficiencies.

Follow-on operational testing of the land attack Tomahawk weapons system theater mission planning center (TMPC) with block 8.0 software was conducted at the Commander-in-Chief, Pacific TMPC from May through July 1987. The test was limited in that the number of missions produced and flown was insufficient for a valid comparison with mission effectiveness requirements. Thirteen missions were planned, nine of which were associated with the Tomahawk operational test launch (OTL) program with the other four being randomly selected missions to actual operational areas. The TMPC with block 8.0 software demonstrated the potential to be operationally effective and suitable, however, improvements are required. These corrections will be verified in the next phase of FOT&E.

Follow-on operational testing on the submarine and ship launched anti-ship Tomahawk weapon system (TASM) was conducted from March 1984 to July 1987. Full production as well as full fleet introduction was recommended by COMOPTEVFOR.

Follow-on operational testing on the submarine and ship launched conventional land attack Tomahawk weapon system (TLAM-C) was conducted from June through August 1987. Full fleet introduction was recommended by COMOPTEVFOR following correction of defiencies.

TRIDENT SUBMARINE

SYSTEM DESCRIPTION

The Trident, or Ohio class, submarine is designed to provide a survivable launch platform for the undersea strategic missile system. This nuclear power submarine has 24 missile tubes for launch of Trident I (C4) or Trident II (D5) missiles. The hull is larger than earlier classes of missile submarines, and with the vessel's larger propulsion plant, incorporates improved acoustic quieting for increased survivability. The hull also includes a larger access trunk to facilitate the maintenance requirements of the extended operating cycle. The Trident submarine life support systems have been upgraded by the installation of the new MK IV carbon dioxide scrubber and the MK V carbon monoxide/hydrogen burner. A new Trident command and control system (CCS) enables the ship to avoid detection, evade if detected, defend itself, display operational status and maintain strategic communications. The Trident CCS incorporates several existing tactical systems and several new systems, including the AN/BOQ-6 sonar, the MK 118 fire control system (FCS) and command subsystem and the AN/BSC-1 integrated radio room (IRR).

BACKGROUND

Early OT&E of various Trident submarine systems was conducted at various land-based test sites from 1977 to 1982. These tests supported limited production to meet submarine construction requirements. At-sea follow-on OT&E (FOT&E) was conducted on the USS Ohio (SSBN-726) in 1983. Due to severe test limitations for the BQQ-6 sonar and deficiencies in the MK 118 FCS, BSC-1, MK IV scrubber and MK V burner, only limited fleet introduction was recommended. Additional FOT&E during 1986 satisfactorily resolved most of the MK 118 FCS operational issues, but test limitations on the BQQ-6 sonar FOT&E left many operational issues still unresolved.

OT&E ISSUES

Three separate phases of OT&E were conducted or reported on during FY87. BSC-1 IRR operational testing addressed the ability of the IRR to receive, transmit and process communications under normal and emergency conditions, the ability to support the SSBN strategic mission, any characteristics which might contribute to submarine vulnerability and a full range of operational suitability issues.

FY87 FOT&E of the MK IV scrubber and MK V burner was conducted to assess correction of deficiencies noted during earlier operational testing. These included suitability issues such as maintainability of the MK IV scrubber, logistics supportability and interoperability of the MK V burner and adequacy of documentation for both systems. Operational effectiveness of these systems in maintaining submarine atmosphere within limits was observed, but it was not a specific test objective since it was satisfactorily demonstrated during previous tests.

Limited operational testing of the BQQ-6 sonar examined its capability to detect moored mines and enable the ship to avoid them.

OT&E ASSESSMENT

BSC-1 IRR test operations were conducted on board USS Alabama (SSBN-731) during a normal strategic deterrent patrol cycle which included sea trials, transit and patrol operations. Very-low-frequency reception was successful during 100% of the 2,468 hours of required broadcast copy as compared to a 99% criterion. Low-frequency receptions and high- frequency and ultra-high-frequency receptions and transmissions were also successful in all attempts. Message processing was successful in all but one of 4,000 messages (that message was not automatically identified as being addressed to the submarine). During the 2,568 hours of operations there were no critical or major failures which interrupted communications connectivity and there were only three minor failures. The emergency operation was tested by inducing seven different failures to observe system backup operation, and no

deficiencies were noted. All other operational issues were satisfactorily resolved.

MK IV scrubber and the MK V burner test operations were conducted on board USS Michigan (SSBN 727) and USS Henry M. Jackson (SSBN-730) and at the Trident Refit Facility. Only one major failure of the MK IV scrubber occurred during 2,202 hours of operation, and it required 8.25 hours for repair. Although this exceeded the 6 hour repair criterion, reliability and maintainability were more than sufficient to support the Trident submarine mission. The remaining operational suitability issues for both the MK V burner and the MK IV scrubber were resolved with no deficiencies.

Operational testing of the BQQ-6 sonar mine detection and avoidance capability was conducted in accordance with a DOT&E approved test plan on board USS Florida (SSBN-728), USS Georgia (SSBN-729) and USS Henry M. Jackson. Each submarine attempted to penetrate a minefield consisting of six to 10 moored simulated mines located at the Pacific Missile Range Facility, Barking Sands, Hawaii. Although that minefield did not fully represent a threat minefield in size, mineshape configuration, target strength or mooring depth, it was adequate to resolve the operational issues on system effectiveness.

SUMMARY

Although future operational testing may be required for system upgrades, operational testing of the BSC-1 IRR, the MK IV scrubber and the MK V burner is complete. These Trident submarine systems are operationally effective and suitable. The MK 118 FCS requires further FOT&E to verify correction of several deficiencies. There remain several significant BQQ-6 Sonar operational issues to be resolved, including reliability, maintainability and availability (RAM).

PART V

AIR FORCE OT&E

AIR LAUNCHED CRUISE MISSILE (ALCM)

SYSTEM DESCRIPTION

The ALCM is an air-to-ground subsonic missile designed for launch with a nuclear warhead from the B-52 aircraft. The missile is powered by a small turbofan engine in the 600-pound thrust category. Missile navigation is accomplished by an inertial navigation system augmented by a terrain correlation (TERCOM) technique using digital terrain mapping. It is capable of flying mid-altitude, cruise and low-altitude terrain following (TF) missions. The ALCM will fly programmed flight paths at commanded flight modes, speeds and altitudes. The B-52 can carry 12 ALCMs externally, with 6 on each of two wing pylons. Internal carriage is planned for eight ALCMs on a rotary launcher (CSRL) which is scheduled for the B-52H in FY90.

BACKGROUND

The program was initiated in February 1974, with a production decision for the ALCM (AGM 86B) in April 1980. Initial operational capability with the first operational B-52G Squadron at Griffiss AFB, New York, was declared in December 1982. A requirement for more realistic operational testing during the follow-on operational test and evaluation (FOT&E) conducted by the Strategic Air Command (SAC) led to a Canadian-U.S. agreement for operational testing over the more operationally representative Canadian terrain. The first ALCM test launches over Canada were completed on 19 and 25 February 1985. SAC's FOT&E program will continue for the life of the missile. Although there are no major acquisition milestones remaining in this program, DOT&E oversight continues due to the importance of cruise missiles as a class of weapons.

OT&E ISSUES

Critical operational issues include terminal accuracy, terrain following, mission reliability, survivability, and mission planning. These are evaluated through the objectives of SAC's ALCM FOT&E program (Global Cruise). Specific test objectives are designed to 1) provide inputs to SAC planners in determining weapon system accuracy and reliability; 2) verify current operational employment concepts, tactics and techniques, and identify operational deficiencies; 3) verify adequacy of technical data and equipment used in maintenance, check-out and operation of the weapon system--including aircrew, software, hardware and the mission planning system; 4) evaluate performance of the weapon system--to include aircrew, software, hardware and the mission planning system; and 5) continue evaluation of those areas recommended as a result of previous testing.

OT&E ACTIVITY

The ALCM FOT&E program continues to be conducted by SAC. As of the end of FY87, 45 ALCM launches had been conducted with 9 in FY87. Of the nine ALCM test missions flown in FY87, two were over the Canadian Test Route, and the remaining seven were flown over U.S. routes. Test results are reported annually in SAC's B-52 Integrated Weapon System Follow-on Operationl Test Report and SAC's evaluation of ALCM performance, which is provided to JCS. The SAC test program is expected to conduct approximately eight ALCM test missions per year for the life of the system.

OT&E ASSESSMENT

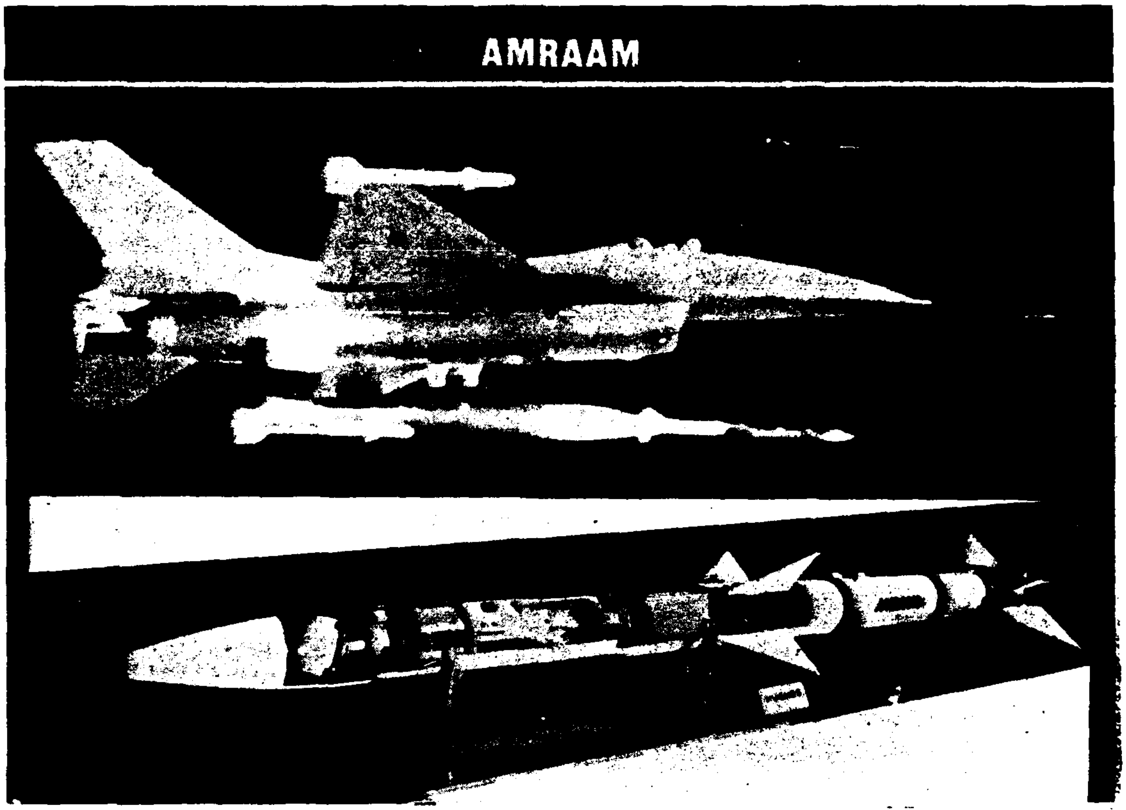
The accuracy of the ALCM missiles flown this year, using full missile navigation capability, was excellent In the 6 October 1986 test, the missile successfully flew for approximately 1 hour and 23 minutes. Then during a terrain following segment, it failed to climb sufficiently and crashed on a hill. Investigation determined that an anomoly had existed in the mission

planning software that did not alert the planner of a potential terrain clearance problem. Action has been taken by SAC to correct the mission planning problem. In the 29 May 1987 test there was no indication of either engine start or deployment of the flight control surfaces after separation from the B-52. The problem was caused by a failure in the operation of a separation- ignition switch pin. The overall missile reliability of ALCM remains good. DOT&E review of ALCM test planning resulted in direction to the Air Force to improve several areas of the program, including evaluation of mission-planning capability, consistency of analysis methodologies, and an internal Service review of cruise missile testing to ensure a coherent approach to testing of this class of weapons throughout their life cycles.1

SUMMARY

To date, operational performance demonstrated by this FOT&E program shows that the ALCM continues to perform satisfactorily and has met specifications in suitability, reliability and maintainability. Important results achieved from recent testing include the validation of revised software for the B-52 and successful free-flight tests over the more rigorous Canadian Test Route.

AMRAAM (AIM-120A)



SYSTEM DESCRIPTION

The Advanced Medium Range Air-to-Air Missile (AMRAAM) is the next-generation all-weather, all-environment, medium-range air-to-air missile system for use by the Air Force, Navy and NATO forces. AMRAAM is designed to be employed within and beyond visual range, and compared to the existing AIM-7 Sparrow, which it replaces, AMRAAM provides increased firepower and combat utility and effectiveness, while significantly reducing aircraft and aircrew vulnerability. Increased average missile velocity provides the capability to outshoot threat aircraft by increasing the separation between the launch aircraft and the target at AMRAAM intercept. Reduced miss distance, improved fusing and increased warhead lethality combine to greatly enhance missile lethality. The AMRAAM's active radar-seeker provides a launch-and-maneuver capability for increased survivability and multiple target engagement on a single intercept. Improved clutter rejection and inherent ECCM capability enhance the missile's performance at low altitudes and in a countermeasure environment. Improved system reliability, maintainability and logistic supportability increase overall operational availability and effectiveness.

BACKGROUND

The AMRAAM program responds to a 1978 Joint Operational Requirement. Full-scale development (FSD) was initiated in December 1981, with a follower contractor selected in July 1982. Schedule delays and cost increases caused program slowdown, leading to an OSD-directed investigation of alternative methods for reducing AMRAAM costs in January 1985. In June 1985 the Secretary of Defense approved a revised program which incorporated cost-reduction measures and set cost caps. The FY86 National Defense Authorization Act required the Secretary of Defense certification of the Air Force production program at $5.2 billion in FY84 dollars, and a full-scale development contract limit of $556 million. The FY87 Authorization Act capped the program at $7.0 billion for 24,000 Air Force and Navy missiles, but allowed adjustment due to Congressional actions. The development test program has accomplished 45 firings through FY87, with 8 failures and 2 no-tests. It should be noted that some test objectives were accomplished on all firings.

OT&E ISSUES

Critical operational issues include autonomous employment (launch and leave), multiple kills per engagement, selected target kill in multiple formation, capability against maneuvering targets, effectiveness in the electronic combat arena, aircrew work load, reliability and maintainability. Specific objectives in each of these areas are designed to ensure this weapon will meet the exacting demands of the next generation of air-to-air weapons.

OT&E ACTIVITY

AMRAAM initial operational test and evaluation (IOT&E) began in October 1985 with the start of the Captive Carry Reliability Program, phases I and II (CCRP I and II). The operational portion of combined AMRAAM FSD is being conducted by the Air Force Operational Test and Evaluation Center (AFOTEC), and tests are scheduled to be completed in January 1989. The IOT&E objectives will be evaluated using data from both development test and evaluation (DT&E) and IOT&E tests, including: 1) mathematical modeling and simulations, 2) maintainability demonstration, 3) three phases of CCRP, 4) AMRAAM captive equipment (ACE) missions, and 5) live missile firings.

All phases of testing are currently underway. The modeling/simulation effort and maintainability demonstrations have been conducted since the beginning of FSD. Hardware-in-the-loop (HIL) simulations have been used primarily to support software development and the live fire program, however, separate evaluations have been performed using 18 predefined scenarios to explore several missile capabilities. CCRP II was combined DT&E/IOT&E involving AMRAAM carriage on the F-16. CCRP III will be a separate IOT&E evaluation of F-15 carriage. The IOT&E ACE missions began in October 1986 as part of the preparation for the first IOT&E live firing on 16 October 1986. The combined live fire portion will continue until November 1989. Ninety missile firings are planned in FSD, 25 of which are dedicated IOT&E launches to be fired through December 1988.

OT&E ASSESSMENT

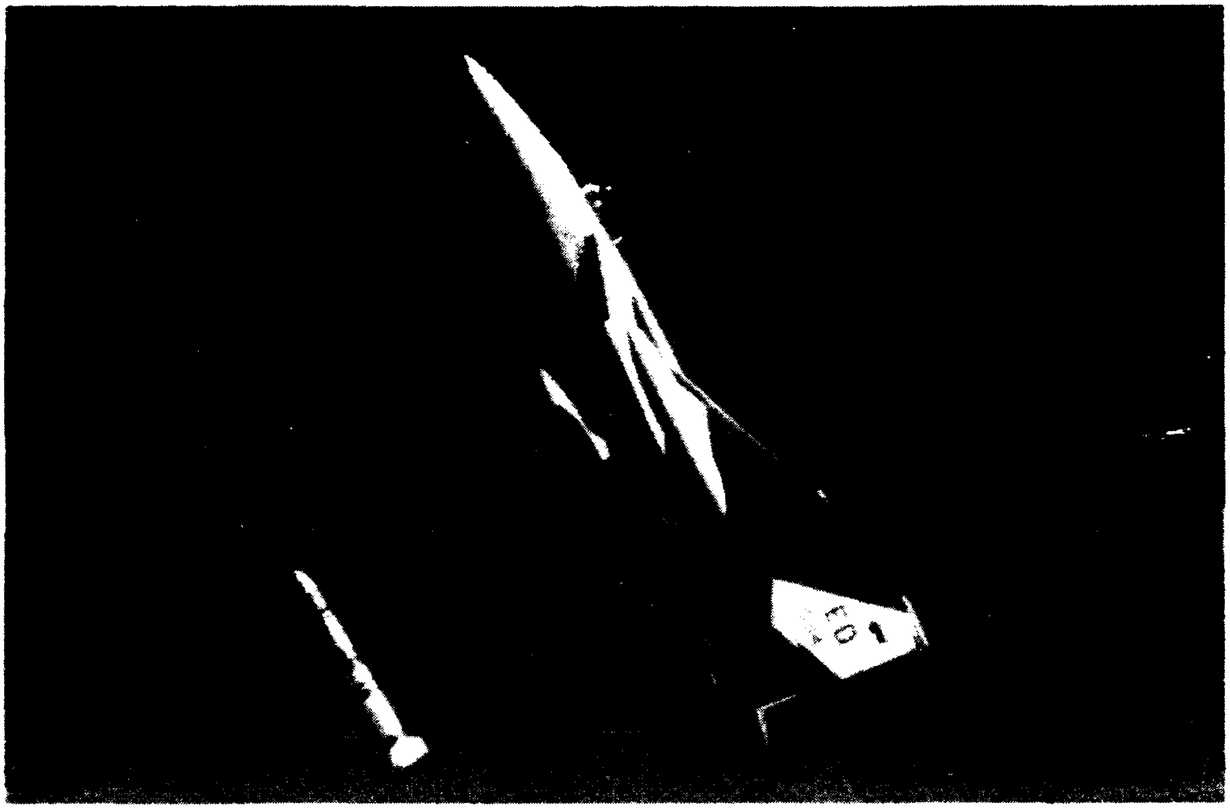
Flying activity during FY87 and early FY88 (through Feb 88) consisted of six OT&E missile firing missions (eight missiles) being accomplished and completion of CCRP II which involved 800 captive carry hours on F-16s. Three shot scenarios were considered successful with regard to most test objectives. Three other missions were unsuccessful, as major test objectives were not met.

OT&E testing is approximately 50 percent behind the Jun 1987 Defense Acquisition Board (DAB) schedule. Firing schedule delays have been caused by many factors, including problems with target drones, range instrumentation simulators, ECM pods, shooter aircraft availability, and software development. The target drone formation and ECM pod requirements are becoming much greater in the more advanced mission scenarios. Both types of assets are fragile, and problems with either could cause further delays. The captive carry program on the F-15 (Phase III, 2,000 hours), orginally scheduled to begin in the summer of 1987, has been slipped to start in mid-FY88. This was caused by a missile fin failure discovered during carriage on the F-15. The problem was identified, and a change is being tested. The fin failure problem has not been a factor in delaying the shot schedule.

SUMMARY

The AMRAAM program is significantly behind both the December 1986 schedule and the revised 1987 schedule. The progress of OT&E shots is not encouraging. Problems that need attention continue to be found although most appear to be solvable. Schedule delays as deficiency corrections are incorporated reflect the risk involved in doing concurrent DT/OT. Technical challenges and the fraility of the test support required in future operational test missions may cause this program to slip even more.

ANTI-SATELLITE WEAPON SYSTEM (ASAT)



SYSTEM DESCRIPTION

The air-launched ASAT missile system currently under development has two elements, the missile and the carrier aircraft equipment (modified F-15). The missile uses a modified short range attack missile (SRAM) for the first stage, and an Altair III motor for the second stage. The second stage also contains the missile guidance assembly, a cryogenic system and the miniature vehicle (MV) dispenser. The MV, carried in the second stage, is the terminal warhead of the missile and is designed for hyper-velocity-impact kill. Surveillance and targeting data will be provided by the existing Space Surveillance Network. A command and control system to generate mission profiles and direct intercept missions will be provided by a mission control center to be located in the Cheyenne Mountain Complex, Colorado. To support ASAT testing, a dedicated target satellite called an instrumented test vehicle (ITV) was also developed.

BACKGROUND

This program is developing and testing an ASAT system in response to National Space Policy guidance and the mission element need statement approved by the Secretary of Defense. Combined developmental and operational test and evaluation (DT&E/IOT&E) began in late 1983 at Edwards AFB, California, with Air Force Flight Test Center and Air Force Operational Test and Evaluation Center (AFOTEC) teams performing joint DT&E/IOT&E activities. The Air Force planned 12 flights from May 1983 through July 1985. However, program turbulence and congressional limitations restricting the number and type of test launches dictated program restructuring and altered the operational concept.

OT&E ISSUES

Critical operational issues are: 1) availability of accurate and timely targeting data, 2) capability to configure sufficient F-15 aircraft, 3) aircraft capability to deliver the missile to a launch volume within specified ASAT launch constraints, 4) missile capability to deliver the MV to a volume in space to enable acquisition and intercept of the target, 5) MV capability to detect, acquire, intercept and negate the specified target; 6) system capability to report the outcome of an engagement, and 7) capability to negate specified targets within time constraints. DOT&E concerns led to the development of a revised test and evaluation master plan (TEMP), which provides more explicit technical and operational characteristics than the original plan. This will facilitate a comprehensive system evaluation should congressionally mandated test restrictions be lifted.

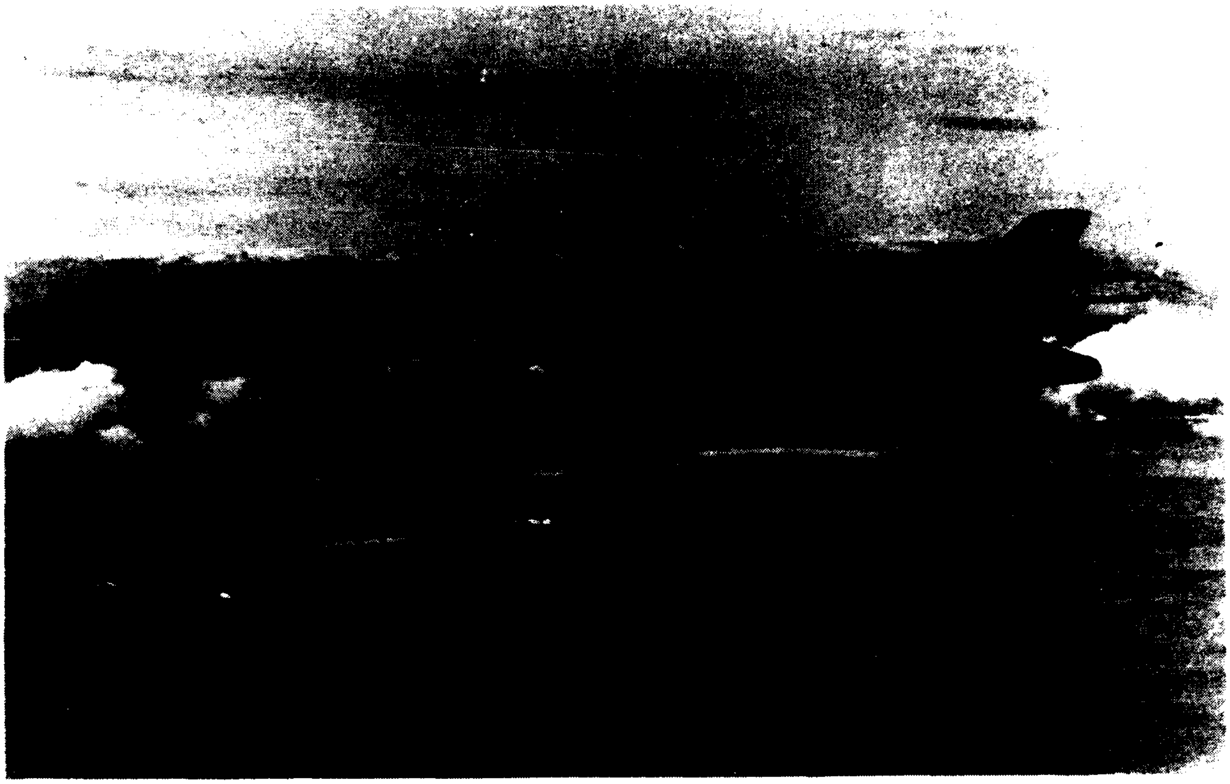
OT&E ACTIVITY

The congressionally imposed moratorium on intercepts of objects in space has been in effect through FY87. Consequently, testing was limited. Two command, control and communications ground demonstrations were completed on 17 December 1986 and 16 March 1987 respectvely. Each was orchestrated by the ASAT test team in the Cheyenne Mountain Complex. There were also four captive-carry flights during FY87. Primary areas investigated in these flights were F-15 subsonic and supersonic launch capability with fleet representative engine trim (96 percent) and uptrimmed (102 percent) engines in winter atmospheric conditions, as well as evaluation of the thermal coating on the forward equipment section of the missile's upper stage. One of the two instrumented test vehicles (ITVs), launched in December 1985, remains on orbit and capable of supporting further testing. The orbit of ITV-2 decayed and it was destroyed upon reentering the atmosphere on 9 August 1987.

OT&E ASSESSMENT

The 13 September 1985 intercept test against a live resident space object (the solar wind satellite designated STP-P78-1) is considerd only as a proof of concept. Continuation of the program with restrictions on intercept testing creates a major risk in taking the system to operational deployment.

B-1B STRATEGIC BOMBER



SYSTEM DESCRIPTION

The B-1B is a strategic multi-role manned bomber intended to deliver conventional and nuclear gravity bombs as well as serve as a cruise missile launch platform. The primary role of this aircraft is as a strategic-attack penetrator which takes maximum advantage of the combined effects of low altitude, high speed, reduced radar cross section, high clutter, and electronic countermeasures to penetrate and survive. Advances in aeronautical and countermeasures technology are contributors to survivability in a projected high-threat environment for this long-range combat aircraft.

BACKGROUND

The Defense System Acquisition Review Council (DSARC) process was completed for the B-1 in December 1976, but production and deployment were cancelled in June 1977. In July 1980, the Department of Defense was directed by Congress to vigorously pursue the full-scale engineering development of a multi-role bomber to achieve an initial operational capability (IOC) not later than FY87. The B-1B took advantage of applicable B-1A test data. However, much B-1A design and testing had not been completed at the time of the program's cancellation. These included dynamic response, aircraft structures testing, flying qualities at low speeds and in engine-out conditions, all-weather/adverse-weather operations, diagnostic tests, electronic countermeasures, weapon delivery and weapon accuracy testing In addition, the capabilities of the B-1B were expanded to include the development of a new offensive avionics system, expanded ECM coverage, and expanded diagnostic system. The B-1B FSD/production contract was signed 20 January 1982, the first flight was on 18 October 1984, and the first delivery to the Strategic Air Command (SAC) 29 June 1985. IOC was declared on 1 October 1986, when the first aircraft was placed on alert status.

OT&E ISSUES

In April 1983, the B-1B commenced a combined development and operational test and evaluation (DT&E/IOT&E) and FOT&E. IOT&E included prior B-1A deficiencies such as APU, weapon-bay acoustics, SRAM/weapon mechanization, fuel center of gravity management system, fuel leaks, flight-control rigging, diagnostics/CITS, defense-system capability, and subsystem supportability. At a minimum, IOT&E must evaluate: navigation reliability and accuracy; low-level penetration capability utilizing terrain following radar and terrain avoidance avionics; the defensive avionics system's ability to detect, identify, and effectively counter multiple threats in all quadrants; the tail warning function (TWF) ability to detect, display and provide expendables (chaff/flare) pulse for airborne interceptors (AIs) and air-to-air missiles; the delivery of dissimilar weapons on multiple targets; critical hardware and software deficiencies; and diagnostics.

OT&E ACTIVITY

B-1B testing continues from Edwards AFB, California (combined DT&E and IOT&E) as well as Dyess AFB, Texas (FOT&E). During FY87 a report was issued on climatic testing conducted at the McKinley Climatic Laboratory, Eglin AFB, Florida. The combined DT&E/IOT&E activities have included radar modes, air alignment, automatic terrain following, stall inhibitor system, air refueling, simulated weapons releases, minimum interval takeoffs, and other developmental activities. FOT&E activities emphasized emergency war order (EWO) profiles, Mod 0 defensive avionics, weapons delivery and navigation and cruise performance as well as suitability measures in such areas as reliability, maintainability, and diagnostics. The operational effectiveness

evaluation is approximately 30 percent complete and the quantitative portion of the suitability evaluation is approximately 38 percent complete. Those percentages indicate a lack of readiness of the aircraft/equipment for test (development progress) as opposed to a backlog of equipment waiting to be tested. Consequently, DOT&E directed the Air Force to prepare written reports on test progress on a quarterly basis. These reports provide ongoing insight into the operatioanl test status of B-1B test progress as well as capability attainment.

OT&E ASSESSMENT

The B-1B is on alert at two SAC bases and is filling an important role. Discussions with SAC crewmembers reveal they are enthusiastic about the aircraft and dedicated to the accomplishment of their mission. A wide range of challenges is being resolved, including terrain following, flight controls, and defensive avionics, problems with weapons release from the aft bay, anti-ice problems, an instrument landing system not yet certified for use down to normal minimum altitudes in weather, and readiness of simulators for crew training. The lack of spares causes an excessive B-1B aircraft not-mission-capable supply rate (NMCS). For example, during the period June-August 1987, the NMCS rate was 24 percent compared to the requirement of 5 percent. Operational aircraft reliability (OAR) is now approximately 0.33, indicating a positive trend toward the mature requirement of 0.86. It is anticipated that contractor engineering support will be required at SAC operational bases for some time to come.

SUMMARY

At this time, the most difficult problem with the B-1B is that the electronic warfare (EW) and tail warning systems have not yet completed development. Since a fully operational defensive avionics system has not yet been delivered, DOT&E considers the progress in defensive countermeasures capability unacceptable.

C-5B AIRCRAFT

SYSTEM DESCRIPTION

The C-5B is essentially a modified C-5A aircraft with many subsystems upgraded to take advantage of technological advances. With few exceptions, the major components and systems incorporated in the C-5B are the same as those currently in use on the post-wing-mod C-5A. Improvements were incorporated to correct problems discovered in the C-5A since its introduction into the Air Force inventory. These changes include improved corrosion protection and hydraulic subsystems; upgraded avionics, flight controls and the Malfunction Detection and Analysis and Recording System; and incorporation of the latest engine configuration. System characteristics and performance will be virtually the same as the C-5A, with a maximum allowable cabin load of 261,000 pounds, critical field length of 10,400 feet, and an unrefuled range of 2,850 nautical miles.

BACKGROUND

The November 1980 C-X mission element need statement (MENS) and the April 1981 congressionally mandated mobility study (CMMS) established the need for additional airlift capability beyond what was currently available. A decision by the Secretary of Defense during the FY83 budget review placed increased emphasis on near-term improvement in intertheater airlift capability and directed funding for 50 C-5B airlift aircraft. The C-5B is a unique program in that it is a sole-source, firm-fixed price acquisition of a system that had been out of production for a considerable period of time. The first production C-5B was the 82nd aircraft off the old production line. The production contract was awarded in December 1982, and the first C-5B flight occurred in September 1985. The 50th aircraft is to be delivered in March 1989.

OT&E ISSUES

The objective of C-5B testing, conducted by the Military Airlift Command (MAC), is to evaluate the impact of new and modified subsystems and components on C-5B operational effectiveness and suitability. The primary operational issues for this program are: 1) Will the C-5B perform the strategic airlift mission equally as well as the C-5A? 2) Have reliability and maintainability been improved while maintaining adequate commonality with the C-5A? 3) Is the intended training adequate for crew members and maintenance personnel to perform the C-5 strategic airlift mission.

OT&E ACTIVITY

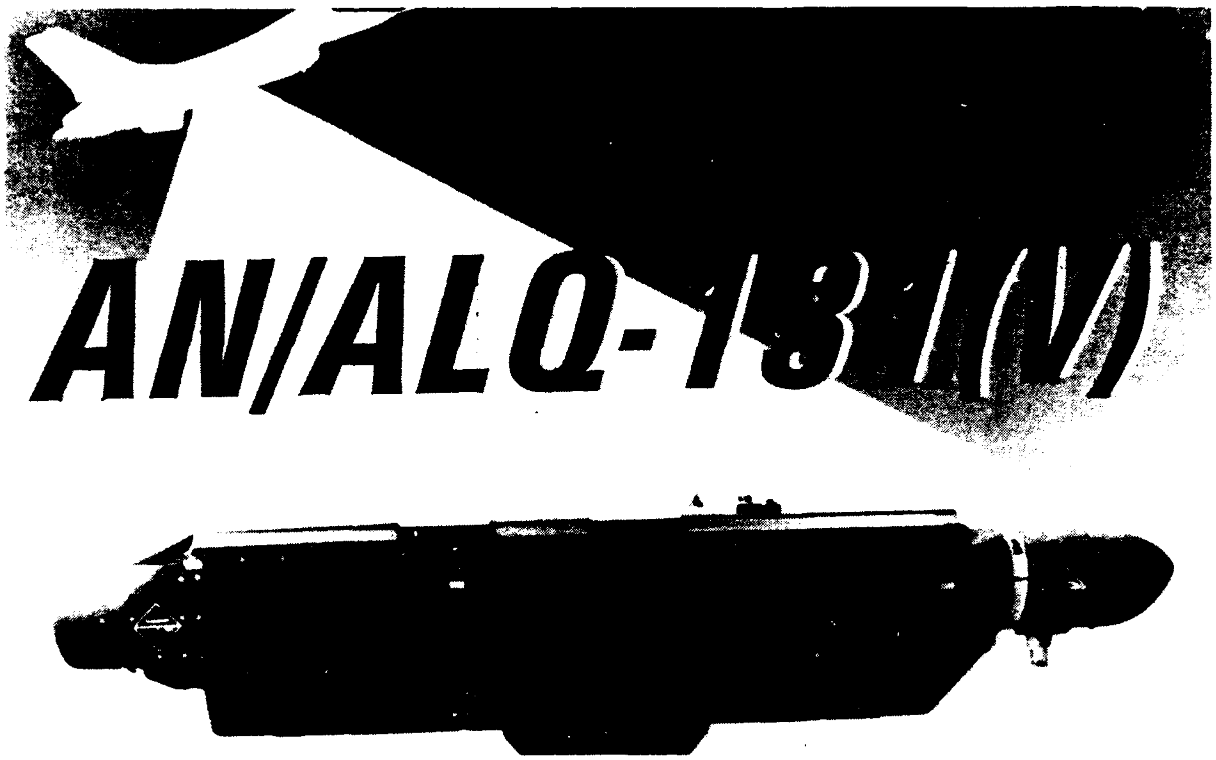
Follow-on operational test and evaluation (FOT&E) for FY87 began during the second quarter to evaluate operational effectiveness and suitability and identify operational deficiencies. This test series is expected to be completed by March 1988. Primary emphasis is on completing those objectives not completed during the qualification OT&E; evaluating changes and modifications made to correct deficiencies noted during prior testing; and evaluating reliability, maintainability and availability (RAM).

The first stage of data gathering has been completed and a second stage is currently underway. The Air Force Airlift Center (USAFALCENT) has concluded that the C-5B is proceeding at or above par with the C-5A. USAFALCENT has identified 88 "watch" items that may require further action.

OT&E ASSESSMENT

Our interim assessment is that this aircraft does perform significantly better than the C-5A, and that reliability and maintainability have been improved. Although this is based upon incomplete data, performance indicators as of the end of September 1987 are as follows: mission capability 73.6 (C-5A, 60.1); departure reliability 92.2 (C-5A, 89.4);

maintenance manhours per flying hour 31.4 (C-5A, 69.8). The difficulties identified on the 88 item watch list are being worked by the appropriate agencies; many with solutions in progress.



SYSTEMS DESCRIPTIONS

Self Defense Systems: These are systems which provide a weapon system platform the capability to operate in a threat environment by countering threat-weapon-systems' tracking and/or guidance systems.

Standoff or Escort Jamming Systems: These systems provide protection for other platforms.

BACKGROUND

This office was involved in providing information for production decision recommendations affecting six electronic warfare systems in FY87. In addition, five more systems were reviewed for possible DOT&E oversight. In FY87, the Air Force had two pod systems and four internal self-defense systems in operational test. The Army had one system in operational test, and the Navy had no systems in operational test. The Government Accounting Office issued two reports on electronic warfare jammers. Both reports were reviewed by this office for operational test concerns.

The following systems were reviewed by DOT&E:

- AN/ALQ-131 Block II Pod. A major upgrade to the Block I pod was operationally tested during FY86 and FY87. The test was performed as a result of GAO concerns of pod reliability and by direction of the DoD Inspector General.

- AN/ALQ-184. A kit modification to the AN/ALQ-119 pod started operational test in 1987.

- QRC-61. During 1987 the Under Secretary of Defense for Acquisition directed that all QRC programs be approved at the DoD level. This Army program was approved, but the proposed procurement program was not approved until operational test planning included tests before procurement.

- AN/ALQ-161. The self-protection system on the B-1B was evaluated for operational test readiness.

- AN/ALQ-165 (ASPJ). Operational tests for ASPJ were postponed to FY88.

- AN/ALQ-135 UPDATE. The self-defense suite operational tests for the F-15E were postponed to FY88.

- AN/ALQ-172/155. The self-defense system for the upgraded B-52H started operational tests.

- AN/AAR-47. Operational tests for the passive warning system used on Marine Corps helicopters were completed.

- INEWS/ICNIA. This is an advanced system for use on ATA and ATF.

- EF-111A/EA-6B: Standoff and Escort Jammers. Operational tests on upgrades are not scheduled until FY89.

OT&E ISSUES

Electronic warfare systems in the field today are plagued by poor reliability and in some cases are difficult to maintain. Several new threat systems have been fielded in the past few years. The major issues, therefore, relate mainly to the suitability issues of reliability and

maintainability. The effectiveness issues are primarily related to the ability of the systems to detect, identify and apply the correct resources with the correct techniques to counter the threat in a dense signal environment. The threat environment includes many threats which do not utilize the RF spectrum (e.g., infrared, laser and optical weapons).

OT&E ACTIVITY

AN/ALQ-131 Block II. Operational test and evaluation of the Block II pod was completed in 1987. Thirty-four flights at Eglin AFB, Florida, plus ground tests at Tindall AFB, Florida were completed during these tests. Simulation tests with the AN/ALQ-131 were run at Air Force Electronic Warfare Evaluation Simulator (AFEWES), Fort Worth, Texas. Comparison tests were run with the Block I pod.

AN/ALQ-184. Operational tests were run at Eglin AFB, the Air Force Systems Command Range at George AFB, California, and the Naval Weapons Center, China Lake, California. Simulation tests were run at Pacific Missile Test Center, Point Mugu, California and AFEWES. All test were completed by November 1987.

AN/ ALQ-161. Tests on the MOD 0 were started at Dyess AFB, Texas.

AN/ALQ-172. Tests were started at AFEWES.

AN/AAR-47. Operational tests were completed.

OT&E ASSESSMENTS

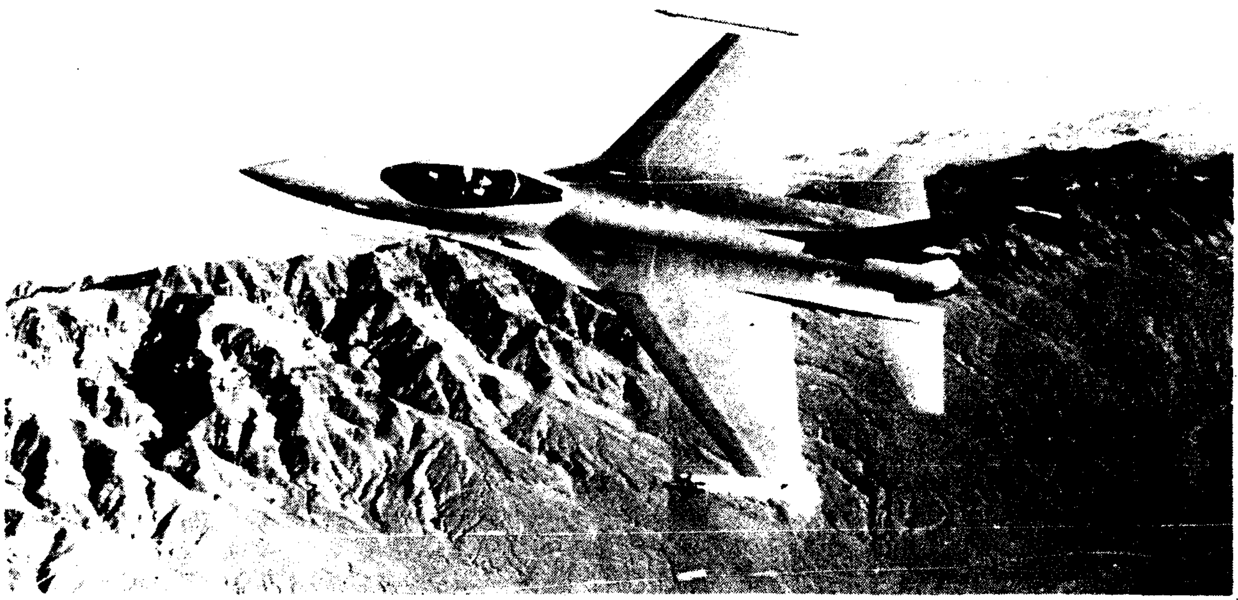
The DOT&E directed the Air Force to test the Block II pod with the receiver/processor to determine the effectiveness and suitability of the integrated system before retrofitting the systems in the field.

Procurement of AN/ALQ-184 systems was scheduled before operational tests were to be completed. The DOT&E in conjunction with the Assistant Secretary of Defense (C3I) directed that operational tests be completed before procurement.

The Army proposed to procure over 500 QRC-61 systems before operational testing. After discussions with this office, the Army agreed to operational tests before procurement.

The B-1B's AN/ALQ-161 system entered operational testing. Deficiencies uncovered in development and operational tests have resulted in a three-phased attempt to fix the system. The MOD 0 phase was a problem definition and configuration management task and was completed in FY87. MOD 1 is to correct most of the software problems and some incorrect jamming techniques. MOD 2 is to correct the remaining software and hardware problems and is scheduled to be completed in FY89. The MOD 1 software is to be compatible with the MOD 0 system.

We found the AN/AAR-47 system to be operationally effective and suitable. As a passive system used to detect missiles, the AN/AAR-47 provides an attractive alternative to such active missile warning systems as the AN/ALQ-153 and AN/ALQ-156.



SYSTEM DESCRIPTION

The F-16 multimission fighter is a single-engine, lightweight, high performance aircraft, powered by a 25,000 pound thrust class afterburning turbofan engine. It is a tactical fighter aircraft with an air-to-air and air-to- surface multi-role capability which can be deployed with minimum enroute support. The F-16 has high reliability and simplified maintenance procedures to assure successful operations under austere conditions. The F-16 multi-national staged improvement program (MSIP) is part of the continuing modernization of U.S. tactical fighters to reverse the upward trend in higher total investment and operating and support costs. The F-16 is employed in a complementary role with the F-15 in counter-air missions and supplements the surface-attack capabilities of the F-4, F-111 and A-10.

BACKGROUND

Air Force operational testing of the MSIP block updates of the F-16C/D has been underway since the combined development and initial operational test and evaluation (DT&E/IOT&E) conducted from January 1983 through December 1984. In addition, the Air Force Operational Test and Evaluation Center (AFOTEC) conducted independent F-16C/D IOT&E from January to April 1985 to evaluate F-16 enhancements resulting from the F-16 MSIP. The MSIP consists of phased improvements in F-16 air-to-air and air-to-surface mission capabilities by incorporating new developments in weapons and sensors. Basic changes in the F-16C/D include an improved radar (AN/APG-68), improved cockpit displays, wide-angle head-up display (HUD), increased computer speed and capacity, and provisions for future incorporation of the advanced medium range air-to-air missile (AMRAAM), the low altitude navigation and targeting infrared for night (LANTIRN) system, the airborne self- protection jammer (ASPJ), the Global Positioning System (GPS), and the ALR-74. The Tactical Air Command (TAC) began a follow-on operational test and evaluation (FOT&E) in July 1985. Block 25B F-16Cs were flown and evaluated from July 1985 to February 1986.

OT&E ISSUES

Subsequent testing of F-16C/D Block 30 operational flight programs and some hardware changes were done from February to September 1986 and reported in FY87. The Block 30 OFP update includes changes to the air-to-air, air-to-surface, and routine operation computations in the F-16C avionics suite. Some features of the OFP were not tested because the required hardware changes could not be accommodated (e.g., the engine monitoring system). Another Block 30 MSIP hardware change test was a one-week evaluation of the GE F-110 engine. The Block 30 testing addressed operational effectiveness objectives, but did not evaluate suitability objectives because the OFP changes have only minimal effect on the aircraft's reliability, availability, and maintainability. Test objectives included assessment of the effect of MSIP hardware and software modifications on F-16C operational effectiveness during routine air-to-air and air-to-surface operations. The test also assessed and identified the impact of MSIP modifications on F-16C pilot performance/workload, current tactics and operational training.

OT&E ACTIVITY

Five hundred and twenty-six sorties were flown by Detachment 1, 57th Fighter Weapons Wing, from Luke AFB, Arizona, at ranges near Luke AFB, Edwards AFB, California, and Nellis AFB, Nevada. Deployments were flown to Nellis AFB for live ordnance and special weapons testing and to Edwards AFB for limited F-110 engine testing (six sorties).

OT&E ASSESSMENT

Testing showed that progress has been made correcting deficiencies identified during Block 25B testing. Conventional weapons delivery accuracy showed significant improvement as a result of revised ballistics and updated separation effects coefficients. Added steering modes and improved displays also enhanced air-to-surface effectiveness.

Limited evaluation of the F-110 engine in the production Block 30 F-16Cs indicated improved performance capabilities compared to the F-100 engine at low to medium altitudes. The Dash 34 inertial navigation unit provided improved avionics interface.

The overall operational effectiveness of Block 30 was satisfactory.

SUMMARY

The Block 30 F-16C has improved capability over previous blocks, especially in the areas of air-to-surface weapons employment with conventional ordnance, radar performance, and engine performance with the F-110 engine.

Improvements in weapons delivery employment/accuracy are required for dive toss and fixed target track deliveries. An operational test and evaluation/tactics development and evaluation is necessary to determine the type and amount of training required for pilots to use advanced ECCM in an operational environment.

GROUND LAUNCHED CRUISE MISSILE

SYSTEM DESCRIPTION

The ground launched cruise missile (GLCM) is a ground-launched variation of the Tomahawk land attack nuclear cruise missile. The GLCM tactical systems are the all-up round, which includes the Tomahawk BGM-109G missile, booster, and canister; the transporter-erector launcher, which carries four missiles; and the launch control center. The missile carries a nuclear warhead and flies a preplanned route using a self-contained inertial navigation system updated by digitized terrain-contour-matching map comparisons. The support subsystems are operations and basing, logistics, and the theater mission planning system.

BACKGROUND

The first FSD flight of the GLCM occurred in May 1980. Initial operational test and evaluation (IOT&E) was combined with development test and evaluation (DOT&E/IOT&E) from May 1982 through July 1983. Follow-on test and evaluation (I) (FOT&E (I)) was conducted 1 June 1983 through 30 June 1984. FOT&E II began 1 July 1984 to confirm correction of previously identified deficiencies, ensure that the system could meet operational requirements, support Department of Energy warhead testing, and comply with JCS weapon system evaluation guidelines. Flight testing was suspended in October 1986, and restarted as FOT&E (IIB) in May 1987 to differentiate evaluation of "new" missiles and determine reliability differences between those and the "old" missiles previously flight tested.

OT&E ISSUES

The following critical issues apply to testing of the GLCM system: 1) Is the system sufficiently reliable and available? 2) Can the mission planning system provide needed data within reasonable times? 3) Can the missile, programmed by operational mission planners, achieve required navigation, terrain following, and target accuracy? 4) Can reliable command, control, and communications be established and maintained? 5) Is the GLCM compatible and interoperable with other systems? 6) Can logistics support and basing subsystems adequately support the weapon system? 7) Is the software adequate? 8) Are man-machine interfaces adequate? 9) Can acceptable security be maintained? 10) Can acceptable human, weapon system and nuclear safety be maintained?

OT&E ACTIVITY

Operational flight testing was on hold during early FY87 while the Air Force conducted a series of development ground tests. Due to concerns raised by DOT&E as well as other DoD agencies, the Air Force has undertaken a rigorous program to assess/improve missile capability. It includes functional ground tests, a quality improvement program, flight-critical-item investigations, a qualification program evaluation, and guidance-set operational reliability demonstrations. During the second half of FY87, five operational flight tests were conducted. Ground Testing has collected data from RAF Base Greenham Common, United Kingdom, and Comiso Air Station, Italy to evaluate reliability, maintainability and availability (RAM) of the transporter erector launchers, the launch control centers, and their mobile power sources. Eleven communications exercises were conducted during this period to evaluate communications reliability and availability.

OT&E ASSESSMENT

As a result of numerous missile deficiency corrections, assessments have been made of missiles delivered prior to 1 April 1985 (Group A) and of those delivered after that date (Group B). A third subset of the missile population (Group C) will identify the Group A missiles which are upgraded. Mission reliability for the deployed fleet (which includes other system components such as the launch control system and communications) was also calculated.

The five GLCM free-flight tests conducted in FY87 all resulted in the missiles successfully reaching their designated targets.

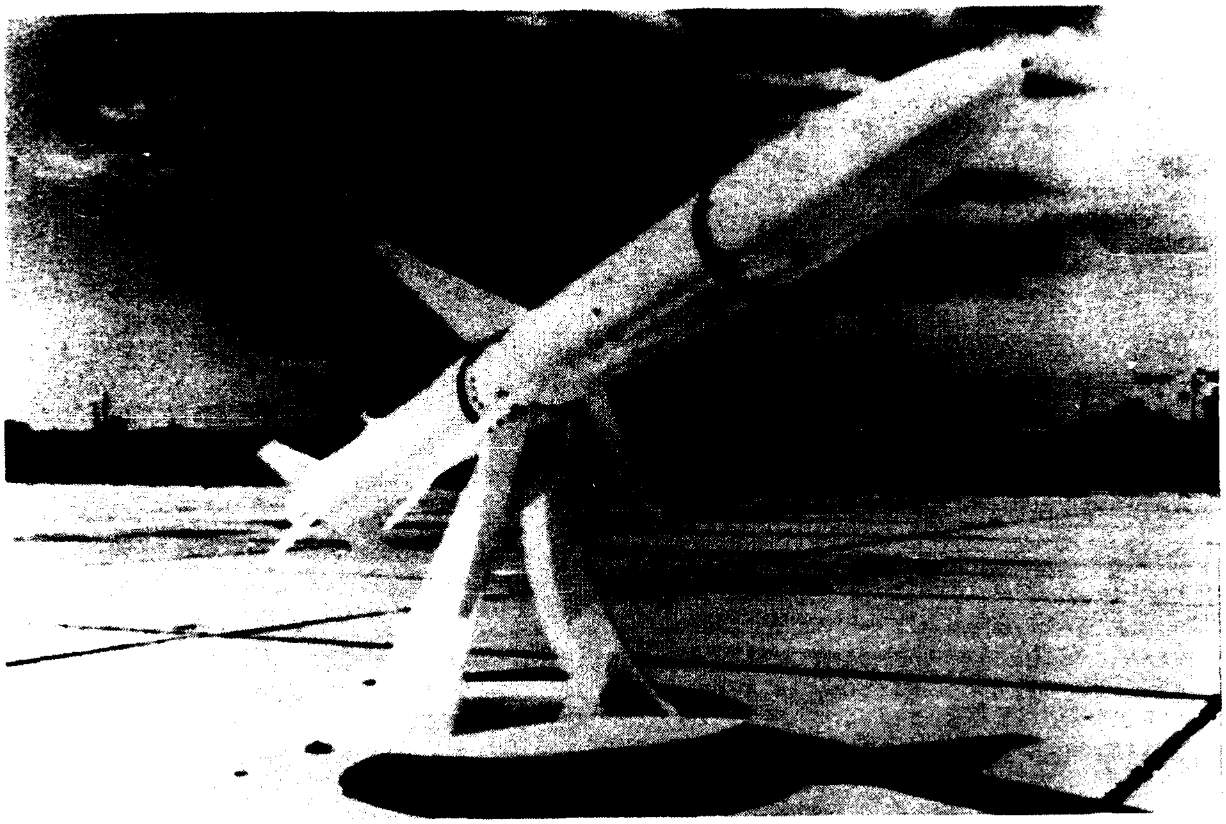
Seven of the flight-test missiles received over-the-road (OTR) testing to evaluate the dispersal portion of the end-to-end mission. One missile failed a built-in-test (BIT) during OTR testing and was returned to the factory. It will not fly during FOT&E II.

Communications reliability is broken into three operational modes (on base, dispersed, and convoy). As expected, communications reliability while in convoy is lower. This can be attributed to terrain masking and signal attenuation caused by forested and built up areas.

SUMMARY

These samples indicate improvement in quality and overall missile effectiveness. Continuation in the trend shown by FY87's successful flights would corroborate the apparent improvements, however, in accordance with the Intermediate-Range Nuclear Forces (INF) Treaty, GLCM production and testing have been terminated.

AGM-88A HARM (AIR FORCE)



SYSTEM DESCRIPTION

The High Speed Anti-Radiation Missile (HARM) is an air-to-surface missile designed to suppress or destroy land and sea-based radars which direct enemy air defense systems. HARM is a design evolution of ARM weapons (Shrike and Standard ARM) and is the primary weapon used on the F-4G Wild Weasel defense suppression weapon system. Performance characteristics include: high speed, large footprint, high sensitivity to weak signals and software adaptability to the constantly changing threat. HARM weighs 807 pounds, is 164 inches long and is 10 inches in diameter.

BACKGROUND

Joint Navy/Air Force initial operational testing of HARM began in 1979 and resulted in full production and USAF initial operational capability in September 1984. Missile deficiencies identified in testing are being addressed through a performance upgrade program and tested in follow-on operational test and evaluation (FOT&E). The first phase of FOT&E was completed in November 1984 and consisted of one missile firing to verify software corrections.

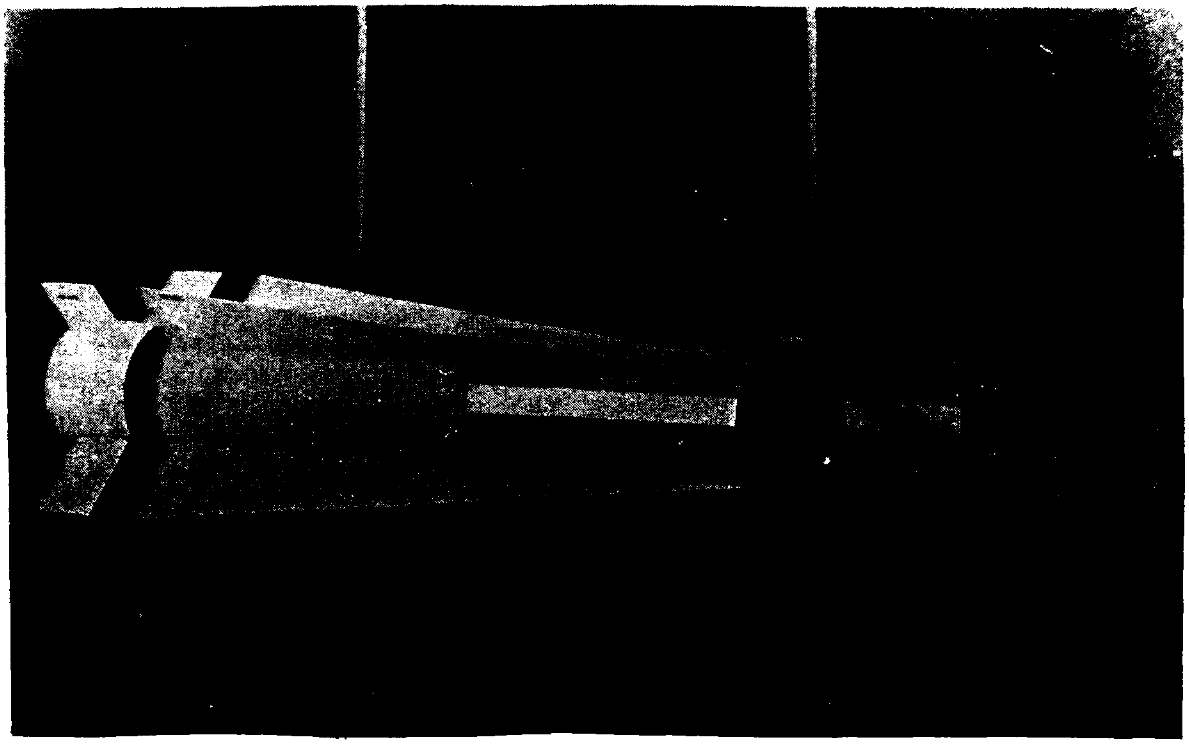
OT&E ACTIVITY

The second phase of FOT&E has been in progress since February 1986. Flight testing of four missiles was completed in June 1987. An extensive captive-carry flight program was conducted to further evaluate production missile effectiveness and reliability. Flight testing was conducted on test ranges at Nellis AFB, Nevada, and the Naval Weapons Center, China Lake, California.

SUMMARY

Final FOT&E results are not yet available pending further ground testing. Results of this ground testing will be combined with other data from both phases of FOT&E and included in the AFOTEC HARM FOT&E Final Report, to be published in the second quarter of FY88.

AGM-65D MAVERICK MISSILE (IR MAV)(AF)



SYSTEM DESCRIPTION

The imaging infrared IR Maverick (AGM-65D) was developed as an improved version of the AGM-65A and B television-guided Maverick (TV MAV), by providing a capability at night, in limited adverse weather and other reduced visibility conditions against armor and other ground targets. The missile weighs approximately 490 pounds and employs a 125-pound conical shaped-charge warhead. Except for the forward section, containing guidance and control, the physical structure of all Mavericks is similar. The seeker section contains the optical system that collects and focuses the incident infrared (IR) radiation and generates the IR image scan. The electronics section includes circuits for additional signal processing and scan conversion to standard television video format for cockpit display. The IR MAV reduces the effects of weather, contrast and shadow, which hampered performance of the TV MAV.

BACKGROUND

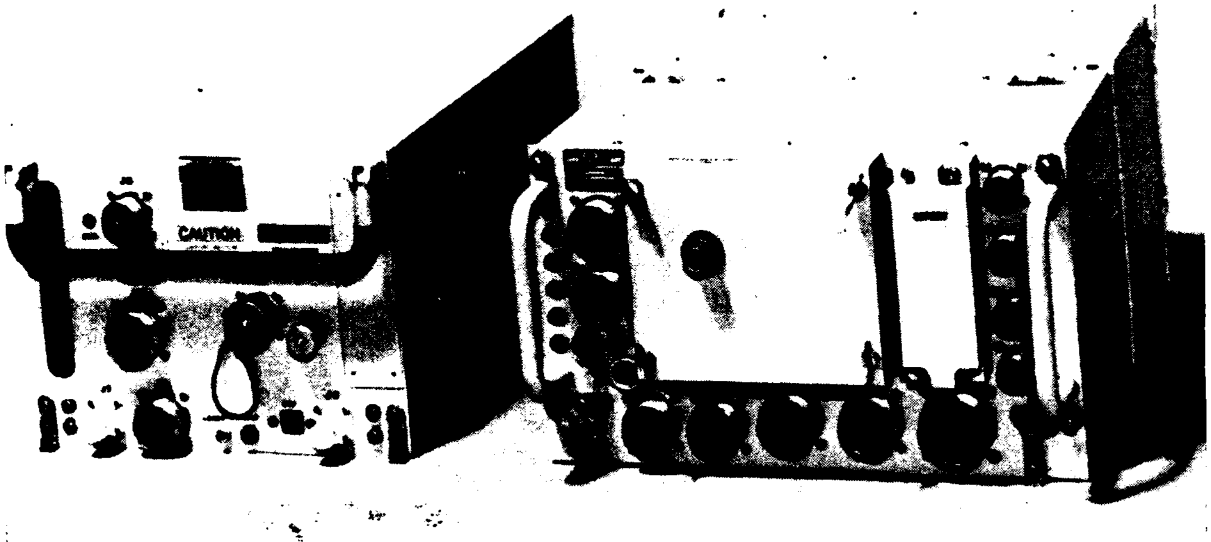
Initial operational test and evaluation (IOT&E) of the AGM-65D was conducted from February 1981 to August 1982. During that series of tests, it was determined that operational suitability was deficient in the areas of missile reliability upon delivery from the contractor, logistic reliability and mission-hardware reliability. After incorporation of contractor modifications, a Reliability Maintainability Validation Program was completed in January 1983, and significant improvement was demonstrated in all areas of reliability and maintainability. Lot 2 production missiles (CY85 deliveries) included numerous changes incorporated as Engineering Change Proposal (ECP) 604. These changes were designed to enhance the producibility of the missile guidance and control section. The IR Maverick then entered low-rate initial production (LRIP), while an OSD-directed follow-on test and evaluation (FOT&E) further examined target acquisition and attack capability, survivability of delivery aircraft, impact of ECP 604, and operational suitability. In our view, these test results demonstrated that tactical aircrews can acquire and attack valid targets in unfamiliar, European-like terrain, that survivability was satisfactory, and that ECP 604 resulted in no statistical difference in effectiveness while significantly improving suitability. We found that operational suitability of the IR Mavrick exceeded all established thresholds with the exception of the Guided Missile Test Set (GMTS), which required further testing. Based on FOT&E results, the missile entered full production. Special test conducted in July 1986 demonstrated that the GMTS deficiencies had been corrected. An assessment of the FOT&E (phase I) testing and results was reported to the Congress and the Secretary of Defense in our Beyond-LRIP report of 16 April 1986. FOT&E (phase II) was completed in November 1985.

Phase II evaluated IR Maverick suitability and operational effectiveness, refined tactics and techniques for employing the system, recommended training programs and evaluated corrections to deficiencies discovered in previous testing. Nineteen day and night sorties were flown to accomplish 25 launches against vehicles with operating engines. Missile reliability was satisfactory, with incoming missile reliability demonstrated at 96% vice threshold of 95%, mission success probability of 96% vice threshold of 64%, and mean time between maintenance of 89.1 hours vice a threshold of 36 hours. We judged maintainability and logistics supportability to be satisfactory. Employment tactics were developed and the aircrew training requirement for IR Mavrick proficiency proved adequate, with six sorties per training period.

OT&E ACTIVITY

No further operational testing of the AGM-65D Maverick occurred in FY87 and, except for continued tactics development and weapon evaluation firings necessary to fully exploit the missile's capabilities and train aircrews, none is planned in the future. A variant of the basic "D" model Maverick, the AGM-65G, will incorporate a larger warhead and other modifications. Operational Testing of this "G" model will begin in FY89.

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM (JTIDS)



SYSTEM DESCRIPTION

The Joint Tactical Information Distribution System (JTIDS) is a jam-resistant and secure digital communications terminal being developed for integration into various weapons systems and facilities of each Service and allied countries to provide communications (data and voice), navigation and identification (CNI) capabilities for joint and combined military force operations. A JTIDS configuration designated as the Class 1 terminal has been integrated into Air Force and allied country operational E-3 aircraft. The JTIDS Class 1 terminal has also been integrated into the Air Force operational adaptable surface interface terminal (ASIT) shelters to provide an interface between tactical air control system (TACS) elements and the joint tactical air operations (JTAO) JTIDS network consisting of the E-3A airborne warning and control system (AWACS), F-15 aircraft, and Army air defense components. A smaller and higher capacity Class 2 JTIDS terminal was developed for integration into F-15 aircraft, other-Service key tactical platforms, and eventual replacement of the Class 1 terminals. The Class 2 terminal is bilingual and can process both the new tactical digital information link J (TADIL J) formats and the interim JTIDS message specification (IJMS) messages used by the JTIDS Class 1 terminal to allow JTAO system interoperability.

JTIDS communications are conducted in a time division multiple access (TDMA) protocol which permits operation on a single net or on multiple nets to share information in near real-time. JTIDS information is broadcast omni-directionally at high data rates and can be received by any terminal within line-of-sight propagation range. Each terminal can be set to select or reject each message according to its need for that information. A JTIDS equipped platform could use on-board navigation, weapons and radar systems to automatically feed status information to the integrated JTIDS terminal and then to a JTIDS net. Information could include target data; JTIDS platform position, velocity and status; and command messages.

BACKGROUND

JTIDS is a major defense acquisition program. The Air Force is lead Service for the JTIDS program, which combined Navy and Air Force efforts from separate research and development programs in the 1970s. The Air Force and Army developed terminals with the TDMA architecture. In October 1985, the Navy joined with the Air Force to use TDMA modules for integration into selected platforms, excluding the F/A-18. Also in 1985, the Army initiated development of a reduced size and capability Class 2M terminal for integration into Army ground systems. The Army will not use JTIDS in aircraft. Power amplifiers are being added to the Air Force Class 2 terminal to create a Class 2H terminal for use in TACS elements and for replacement of the E-3A AWACS Class 1 terminal. Plans are now being made to develop a lower volume (LV) terminal or multi-function information distribution system (MIDS) for NATO applications and for smaller U.S. aircraft (e.g., F-16 and F/A-18) which cannot use the Class 2.

An initial operational test and evaluation (IOT&E) of JTIDS Class 2 terminals which were integrated into Air Force F-15 aircraft and Army air defense components was conducted in FY87. This IOT&E utilized the Class 1 equipped E-3A AWACS and JTIDS ASIT to form a JTAO network for testing purposes. IOT&E results were intended to provide information for a mid-FY87 low-rate initial production (LRIP) decision. The LRIP decision has been delayed until FY88 to allow the JTIDS terminal contractor time to demonstrate improvements in reliability. The Army plans to start development testing of the Class 2M terminal in FY88.

OT&E ISSUES

Current issues concentrate on the extent to which IOT&E results can confirm that the items actually tested are effective and suitable in expected JTAO combat scenarios. IOT&E adequacy was significantly decreased by limitations in the quantity and mobility of Army air defense systems resulting from unsuitable JTIDS Class 2 terminal reliability. The inadequate JTIDS terminal reliability resulted in no Army certification of readiness for IOT&E and a reduction in realism of JTAO utilization of JTIDS during the tests. There were limitations inaccurately portraying the threat throughout IOT&E.

Performance thresholds for message success rate (MSR) for E-3A AWACS and/or ASIT messages to the F-15 aircraft were evolved over the IOT&E period; one of the two was not always available to the F-15, and the minimum standard for a single link was reduced from 80 to 50 percent MSR.

The multi-Service test and evaluation master plan (TEMP) and multi-Service IOT&E plans were not fully approved by OSD. DOT&E efforts are continuing to analyze formal reports on completed studies, analyses, simulations, development and operational tests, and Service preliminary assessments. Additional operational field system test data will likely be required to confirm JTIDS operational effectiveness during JTAO scenarios with realistic threat representations.

OT&E ACTIVITY

A multi-Service test team conducted IOT&E of the JTIDS Class 2 system from 12 August 1986 through 17 April 1987. The Air Force Operational Test and Evaluation Center (AFOTEC) was the lead agency for IOT&E activities. Testing was conducted in three phases at three locations. The first phase was conducted from 12 August to 25 September 1986 at the McDonnell Aircraft F-15 manned air combat simulator facility in St. Louis, Missouri, where 243 simulator engagements were conducted. The F-15 flight test phase was conducted at both the Tyndall AFB and Eglin AFB ranges in Florida from 2 December 1986 to 17 April 1987, with 56 flight engagements during Air Force target efficiency tests. The third phase of testing was conducted from 23 February to 17 April 1987 at Eglin AFB, where the Air Force made 25 flight engagements during multi-Service testing. The JTIDS ASIT follow-on operational test and evaluation (FOT&E) was conducted at Duke and Hurlburt Fields, Florida, from November 1986 to April 1987 and provided the TACS interface during Class 2 IOT&E.

The DOT&E personally observed portions of the IOT&E at the F-15 simulator facility in St. Louis and during the Eglin AFB multi-Service activities. DOT&E staff and support contractors observed other portions of the IOT&E from September 1986 through April 1987.

Other modeling, simulation and analyses have been conducted to support or potentially supplement results from field testing. This includes link connectivity analyses with the TAC JAMIT model, data link vulnerability analyses (DVAL), and modeling by Teledyne Brown Engineering. Test support was also performed by the MITRE Corporation and the Joint Electronic Warfare Center (JEWC).

Advance copies of IOT&E assessment reports were provided to DOT&E by the Navy Operational Test and Evaluation Force (OPTEVFOR), the Army Operational

Test and Evaluation Agency (OTEA), and the Air Force Operational Test and Evaluation Center (AFOTEC). The AFOTEC June 1987 final report on ASIT FOT&E was also provided. A DOT&E preliminary assessment of JTIDS IOT&E results was provided to House Appropriations Committee (HAC) staff at their request.

OT&E ASSESSMENT

IOT&E testing, although limited, was adequate to determine that the F-15's defensive counter-air (DCA) mission was enhanced in a benign Air Force only defensive counter-air (DCA) environment. F-15 flight test results indicated that JTIDS contributed to reducing the percent of hostile bombers reaching their target from 72 to 57 percent and increased the percent of hostiles targeted by F-15s from 45 to 55 percent. These flight test results are not claimed to be statistically significant but include the realism of live systems versus the McDonnell Aircraft digital simulation. Improved situation awareness and mutual support were cited by the F-15 test pilots as the major contributors to JTIDS-equipped mission effectiveness. This situation awareness increased the capability to determine hostile formation geometry. More F-15s were also engaged by hostile fighters during flight tests and reduced F-15 survivability as compared to simulation, which had perfect but unrealistic net tracking of hostiles. Flight tests at Tyndall AFB resulted in an increase in the fraction of F-15s targeted by hostiles from 10 percent without JTIDS to 24 percent targeted when using JTIDS. The McDonnell Aircraft simulation indicated that using JTIDS reduced the fraction of F-15s targeted by hostiles from 45 to 23 percent. Results have not been sufficient and additional data is likely to be required to conclusively confirm F-15 operational effectiveness in DIA validated jamming threat scenarios and multi-Service DCA missions. Further, the Air Force requirements for message success rate (MSR) on key links were evolved over the IOT&E period and require additional Service review to establish appropriate requirements for all platforms. Some system-level issues were raised but not resolved by IOT&E results concerning use of relays, net capacity and management, voice techniques and nets and track correlation accuracy. For example, the known track inaccuracies of the E-3A and CRC were automatically distributed on the JTIDS net and displayed on the F-15 JTIDS display without any indication of the inaccuracy to the pilot.

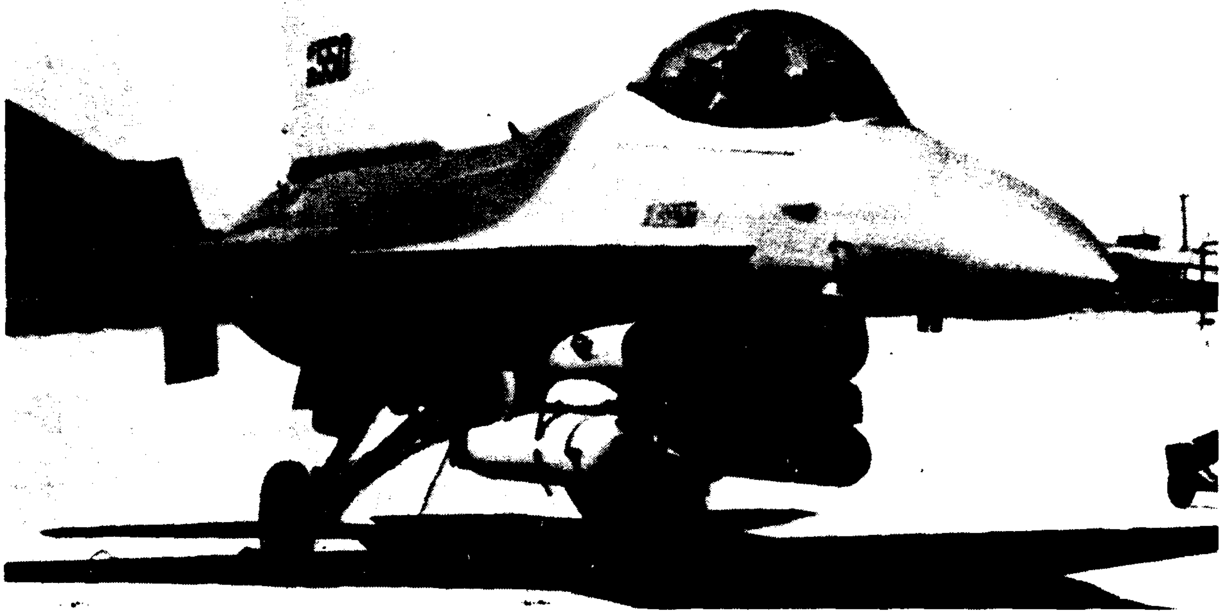
Testing, although limited, was adequate to determine that JTIDS performance in Army ground air defense missions was neither effective nor suitable. Performance was unsatisfactory for Army ground systems and was marginal to unsatisfactory for similarly affected ASIT systems during tests at Eglin AFB. The Army operations identified fundamental problems with JTIDS ground-to-ground links due to signal propagation during the multi-Service phase of testing. It became clear that, in a European environment, Army forward links may be reduced, and much taller antenna masts would be required and/or additional relays required to establish links. ASIT operations also identified ground-to-ground link problems. These problems raised questions concerning JTIDS operational effectiveness as a dedicated ground-to-ground data distribution medium for the Army. As a result, earlier decisions by

Army doctrinal and material developers will be reevaluated to determine further direction. The AFOTEC ASIT FOT&E report has also recommended additional testing to determine key link availability.

As expected from development testing results, JTIDS terminal reliability and maintainability performance was not operationally suitable and has received the most attention since completion of testing at Eglin AFB. These deficiencies were detected during development tests at Eglin AFB and contributed to a reduction of IOT&E realism and Army participation in the operational tests. Mean time between critical failure (MTBCF) was found to be approximately 20 hours as compared to the requirement of 120 hours. The mean time between maintenance was found to be approximately 7 hours as compared to the requirement of 115 hours. The built-in-test was able to detect only 64 of 159 failures and was able to isolate faults to a line replaceable unit only 55 of 159 times.

Limited operational test and evaluation may be necessary to confirm system performance and verify operational implications of ground-to-ground propagation and key link MSR requirement variations prior to a low-rate initial production (LRIP) decision. Additional multi-Service operational test and evaluation will definitely be required prior to a JTIDS full-rate production decision.

LOW ALTITUDE NAVIGATION AND TARGETING INFRARED FOR NIGHT SYSTEM (LANTIRN)



SYSTEM DESCRIPTION

The LANTIRN system is being developed to fulfill the need for a night attack capability in the close air support, battlefield interdiction, offensive counter-air and air-interdiction mission areas. The system is designed for use on F-16C/D and F-15E aircraft and consists of a wide field-of-view (WFOV) head-up display (HUD), navigation (NAV) pod and targeting pod. The head-up display is an electro-optical device which computes flight, navigation and weapon delivery information and displays it in the pilot's line-of-sight. The NAV pod contains a forward-looking infrared receiver (FLIR), a terrain-avoidance radar and subsystems for servo-control. The targeting pod functions include FLIR imaging, laser designation, precision pointing and tracking, and missile boresight correlation for AGM-65D Maverick missile handoff and lock-on.

BACKGROUND

Combined development test and evaluation/initial operational test and evaluation (DT&E/IOT&E) of the LANTIRN system began in July 1983. The LANTIRN program was restructured in August 1984 as a result of lagging target pod development, budget constraints, and unavailability of F-16 test-bed aircraft.

After program restructuring, IOT&E of LANTIRN began in October 1984 and was completed in two phases, which ended in April 1986. IOT&E test results supported a full-production decision for the NAV pod, while FOT&E was planned to evaluate corrections to targeting pod deficiencies before making a full-production decision for that LANTIRN component. The DOT&E beyond low-rate initial production report to the Congress and the Secretary of Defense (14 November 1986) addressed the adequacy and results of the IOT&E of the NAV pod. Our FY86 Annual Report discussed the results of the IOT&E of the complete LANTIRN system.

OT&E ISSUES

In FY87, the DOT&E approved phase one of follow-on operational test and evaluation: The critical issues for LANTIRN addressed during FOT&E(I) were in the same major areas of operational effectiveness and operational suitability as considered in previous testing. Operational effectiveness issues evaluated were: single-seat effectiveness, effective aid to navigation, transition to attack and attack capability. Operational suitability issues were reliability, maintainability and logistics supportability within the framework of the Air Force support system. Seven operational effectiveness and five suitability objectives were evaluated to address these critical issues in a seven month test program during which 63 effective sorties were flown from two geographically and meteorlogically different locations. Test aircraft used were F-16A/B Blk 15 aircraft with avionics modified to a preproduction Blk 40 configuration, while the tested LANTIRN pod components were essentially the full-scale development models used in earlier phases of testing.

OT&E ASSESSMENT

The FY87 FOT&E(I) operational effectiveness evaluation of the LANTIRN system focused on the targeting pod. Of the seven objectives addressed, DOT&E considered two to be satisfactory--IIR Maverick delivery capability and LANTIRN controls and displays. Maverick delivery capability was observed by this office and satisfactorily demonstrated in successful single and dual live launches using FLIR video handoffs from the targeting pod to the missiles. We considered corrections for previously identified deficiencies (focus, mechanization) with LANTIRN/F-16 controls and displays to be satisfactory in FOT&E(I). Similarly, previously poor targeting pod FLIR performance for target identification was shown to be significantly improved. We considered laser-guided bomb (LGB) delivery capability to be

marginal. Unguided weapon delivery testing was incomplete, although the single tested unguided mode of conventional delivery showed satisfactory results.

Although the targeting pod FLIR allowed for improved target identification, the LGB delivery capability in a single-seat aircraft was considered marginal because, on several occasions, the automatic tracker drifted off the desired aim point. Two-seat LGB/LANTIRN capability, such as envisioned in the F-15E, should be satisfactory when tested with existing equipment. A full range of unguided conventional weapon deliveries could not be flown with the modified test bed aircraft because of unresolved aircraft bomb ballistics and toss algorithm problems.

Three other areas--LANTIRN integration into the tactical air forces, vulnerability to electro-optical countermeasures (EOCM) and navigation capability--were tested but not rated in this phase of testing. Navigation capability with LANTIRN and EOCM vulnerability had been judged satisfactory in previous testing. FOT&E(I) EOCM testing completed sorties previously planned for accomplishment in IOT&E.

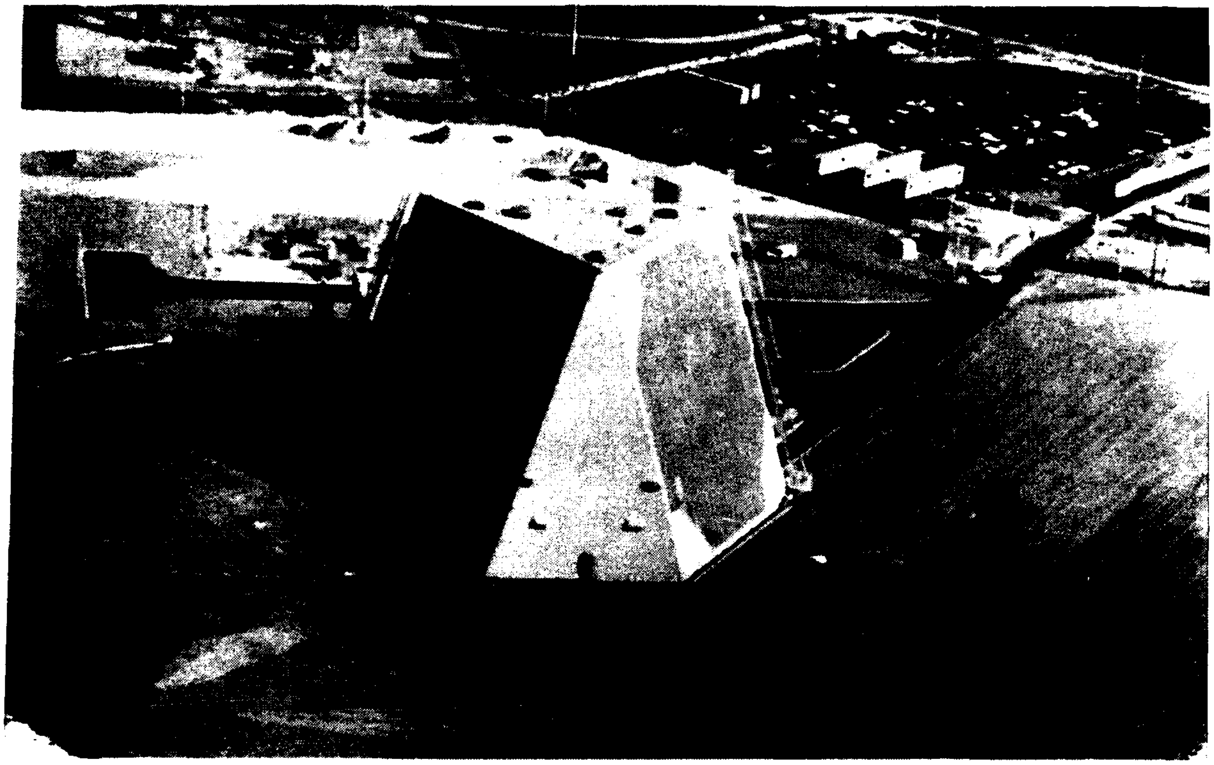
The capability to integrate the LANTIRN navigation pod into the tactical air force (TAF) was evaluated using a proposed training syllabus and young F-16 pilots as students. We considered student pilot workload to be satisfactory for the LANTIRN navigation and terrain following tasks, although pilots using the complete LANTIRN system will require high levels of training to maintain proficiency with the addition of the targeting pod. Increased support to fighter squadrons will be required in some areas such as weather and intelligence.

The operational suitability evaluation of the entire LANTIRN system was addressed by five objectives. We considered logistics support reliability, mission performance reliability and availability to be satisfactory. We rated overall system maintainability marginal--primarily because of targeting pod nose/roll section alignment times, coolanol leaks, water intrusion, and built-in test (BIT) mechanization. Numerous reliability and maintainability improvements for these and other problems have been identified and will be tested in the future. Contractor maintenance was used throughout the test and estimates of Air Force capability were made using over-the-shoulder observations. At the direction of the DOT&E, the Air Force will conduct an evaluation of "blue-suit" maintenance capability with the LANTIRN system when production equipment, support equipment and trained Air Force personnel are available in FY89. In the interim, the Air Force has certified that contractor maintenance and support for the LANTIRN system will be contracted for at an equivalent level to that used during IOT&E. As in previous testing, the logistics supportability evaluation was incomplete, because integrated logistics support elements were not available during the test.

SUMMARY

The LANTIRN system provides a night, single-seat, low-altitude operational capability that does not currently exist in the tactical air forces. As observed by this office during FOT&E(I), the targeting pod demonstrated adequate FLIR target identification performance at long ranges, enhanced Maverick capability, and a limited LGB capability against prominent infrared targets. LANTIRN integration into the tactical air forces will require demanding and unique pilot training as well as enhanced infrared mission planning capability in fighter squadrons. Both the operational effectiveness and suitability of the targeting pod require further improvement and testing before it will fully meet the needs of the user.

PAVE PAWS



SYSTEM DESCRIPTION

PAVE PAWS is a large fixed base solid state phased array radar system used for early warning of submarine launched ballistic missiles. It has a secondary mission of supporting the space track mission of the U.S. Air Force spacetrack system. The PAVE PAWS system interfaces with the NORAD Cheyenne Mountain Complex (NMCC), the Strategic Air Command (SAC), and the Alternate National Command Center (ANCC).

The AN/FPS-123 radar consists of a radar subsystem, a data processing and control software subsystem and a technical facility subsystem. The PAVE PAWS facility is housed in a 10- story, three-sided building whose sides are tilted 20° to permit scanning from the horizon to 85°. The radar phased array faces are on two sides of the building. Each array face has 5,354 antenna elements. The present PAVE PAWS systems utilize 1,792 transmitting elements and 885 passive receiving elements. Four PAVE PAWS sites provide total coverage for the United States.

BACKGROUND

Prior to 1987, two PAVE PAWS sites were installed and operational. Installation and operational tests on site 3 (Robins AFB, Georgia) and site 4 (Goodfellow AFS, Texas) were completed in 1987. Upgrades to the 4 sites are planned.

OT&E ISSUES

The principal critical issues for the PAVE PAWS included:
(1) Can the attack warning/attack assessment (AW/AA) and space track missions be accomplished in a timely manner by site personnel? (2) Can PAVE PAWS transmit accurate mission data via the communication links? (3) Can the system perform its mission in the presence of electromagnetic interference and electronic countermeasures? (4) Is PAVE PAWS mission- reliable? (5) What is the system's operational availability? (6) Can PAVE PAWS be maintained by Air Force personnel? (7) Is the system logistically supportable?

Overall, eight major effectiveness issues and seven suitability issues were evaluated and assessed.

OT&E ACTIVITY

Operational tests of site 3 started in February 1986 and were completed in November 1986. Operational tests of site 4 were started in February 1987 and completed in May 1987. Both sites were declared operational at the end of operational tests and turned over to the operating command.

OT&E ASSESSMENT

The Air Force Space Command operational test and evaluation team assessed the PAVE PAWS radars located at Robins AFB and Goodfellow AFB to be operationally effective and suitable to perform their assigned missions.

PEACEKEEPER MISSILE

SYSTEM DESCRIPTION

The Peacekeeper missile is a four-stage ICBM designed to deliver up to 10 MK-21 multiple independently targeted reentry vehicles (MIRVs). The missile is approximately 71 feet long and 92 inches in diameter, weighing about 195,000 pounds. The first three stages use solid propellants, achieving thrust-vector deflection with single stage movable nozzles. The second and third stage nozzles use specially designed extendible exit cones. The three boost stages produce most of the velocity needed for intercontinental range. The fourth stage provides any needed velocity and attitude corrections prior to release of the MK-21 RVs. The missile is being deployed in modified Minuteman launch facilities containing operational support equipment to provide communication and launch functions. This missile represents an improvement over previous ICBMs by being able to deliver more MIRVs per missile over a larger footprint and with better accuracy.

BACKGROUND

Full-scale development of this intercontinental missile was initiated in 1979. A four-phase, 20-launch test program was planned. The combined development and operational test and evaluation (DT&E/OT&E) commenced in September 1982, with ground activities at Vandenberg AFB, California, using an inert missile to verify compatibility of facility procedures prior to assembly and launch of the first flight missile. The test program evolved from mainly DT&E toward OT&E-oriented objectives. Program phases are 1) missile functional performance, 2) missile/RV capabilities and silo integration, 3) weapon system performance, and 4) operational system verification.

OT&E ISSUES

The combined DT&E/OT&E is investigating the following issues: 1) mission effectiveness, which addresses targeting efficiency, alert availability, and launch and flight reliability; 2) probability of damage, which addresses weapon system accuracy, weapon yield, and target hardness; 3) survivability, which addresses capabilities of the hardware to perform critical functions following subjection to nuclear weapon effects; 4) weapon system integration, which addresses interoperability of new and existing systems, support equipment, and facilities; and 5) weapon system operation and support, which encompasses logistics reliability, maintainability, support equipment, transportation and handling, technical data, supply support, manpower and training.

Two primary system-level measures of effectiveness are used. The first, mission effectiveness factor (MEF), projects on a total force level the percentage of deployed warheads that would produce a nuclear detonation in their planned target areas during wartime execution. The second, probability of damage (Pd), expresses the probability that the resulting nuclear detonation would inflict damage on the intended targets. These are expressed as follows:

MEF = Targeting Efficiency x Alert Availability x Weapon System Reliability

Pd = f(Weapon System Accuracy, Warhead Yield, Target Hardness)

Weapon system reliability and accuracy are directly testable and are the essential evaluation products of the combined DT&E/OT&E program. Warhead yield and target hardness are provided, respectively, by the Department of Energy and the Strategic Air Command (SAC). The remaining issues (survivability, weapon system integration and system operation and support) are being addressed by qualitative assessments.

OT&E ACTIVITY

Seventeen of 20 planned test flights have been completed at the Western Test Range at Vandenberg AFB. Flight 15 (5 December 1986) successfully demonstrated the capability to launch following an extended alert period. Flight 16 (13 February 1987) demonstrated the capability to launch and deploy reentry vehicles over an enlarged footprint which included land impact.

Phase four of flight testing began with flight 17 on 21 March 1987. That flight verified a fix to a penetration aids deployment difficulty (short circuit) experienced on flight 14 (18 September 1986). It also demonstrated launch capability with an alternate ground power source (batteries).

The Peacekeeper/Minuteman common airborne launch control center (ALCC) was tested March-June 1987. Although remaining flights in this test series were to have been completed in FY87, the Air Force decided to delay the last three flignts. We agree that the delay was prudent pending completion of development activity and resolution of anomolies; however, the DOT&E directed that remaining flight tests should be completed as soon as possible.

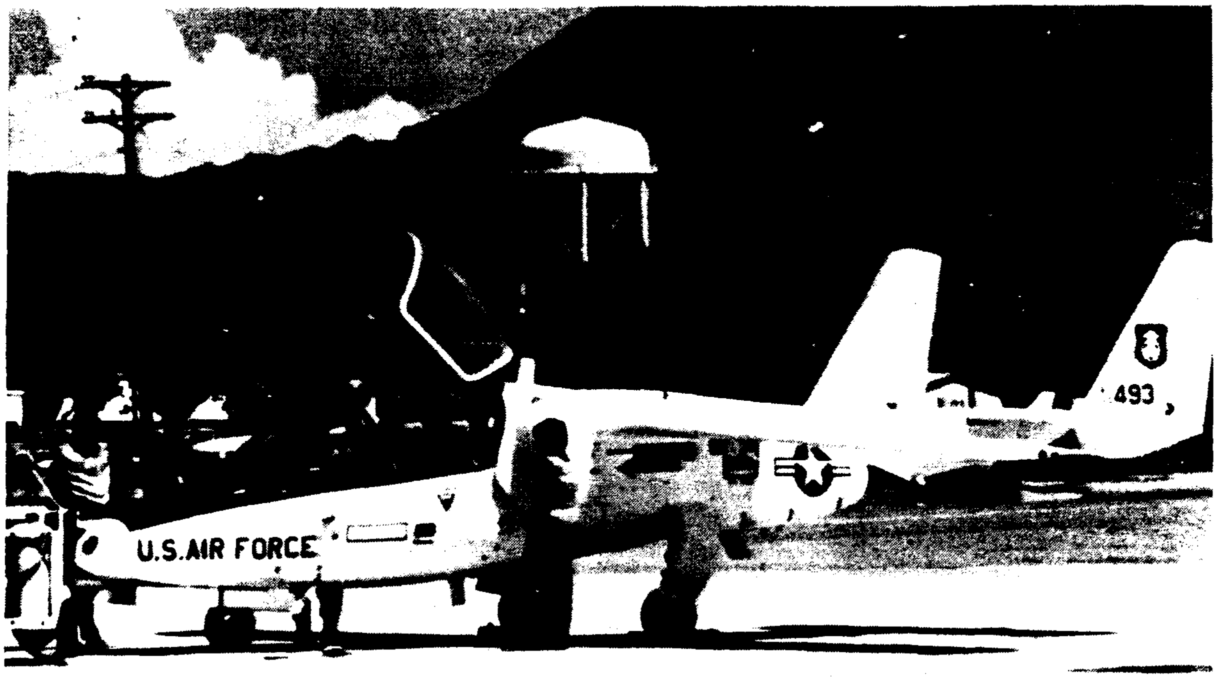
OT&E ASSESSMENT

Reentry vehicle accuracy is evaluated in terms of circular error probable (CEP). Although some reentry vehicles impacted slightly outside the prespecified circle size, the overall CEP is within that circle. We consider 3 of the 17 missions to have been operationally representative in terms of hardware, software and procedures. The composite accuracy on those three was also within the specified CEP value. The calculated mission effectiveness factor exceeds the required value stipulated by SAC. Probability of damage (Pd) calculations for all seventeen flights resulted in a value which is also better than that specified by SAC. The calculated Pd for the operationally representative missions also exceeds the SAC requirement. Tests of the ALCC demonstrated the capability to transmit critical launch commands. However, due to software delivery problems, the ALCC did not demonstrate a capability to perform some non-critical functions. These include retargeting and receiving uplink status from the Peacekeeper launch control facility. Problems do exist with deliveries of operational inertial measurement units (IMUs). As of October 1987, there were 28 missiles in operational silos, of which 10 did not have IMUs installed.

SUMMARY

Although engineering tasks remain and there is an ongoing effort to correct the small impact errors experienced, accuracy and reliability during flight are exceptional. Shortages of missile guidance systems at the operational base has slowed deployment. There were 579 system deficiencies identified during the combined development/operational tests, with approximately 70 remaining open. None of the open items critically affect operational capability. Evaluation of several areas is yet to be completed. These include trainer facilities, hardware, technical publications and support equipment when delivered. Peacekeeper missiles which have all components available meet stated operational requirements.

T-46A



SYSTEM DESCRIPTION

The T-46 is a training aircraft with side-by-side seating, twin engines and pressurization. The design incorporates off-the-shelf equipment where possible, while the turbofan engines and airframe technology are state-of-the-art to ensure fuel efficiency. The T-46 is intended to replace the T-37 in all Air Force training roles with such improvements over the T-37 as lower fuel consumption, significantly improved weather capabilities, improved range and endurance, modern avionics and instruments, noise levels that meet today's limits, lower maintenance costs and higher performance.

BACKGROUND

Fairchild Republic Company (FRC) was awarded the T-46 contract in July 1982 for development and production of two prototype aircraft (T-1 and T-2). The first production option (Lot I) was exercised in November 1984, and first flight of the T-46 was successfully completed on 15 October 1985. Congress appropriated funds for FY86 Lot II production aircraft; however, the Lot II option was never exercised because of FRC manufacturing problems and schedule delays. Because of the FRC difficulties and fiscal constraints placed on the Air Force, the T-46 program was cancelled in March 1987. The Air Force maintained possession of both T-1 and T-2 and the first production aircraft (P-1). These aircraft were used in initial operational test and evaluation (IOT&E).

OT&E ISSUES

The T-46A critical operational test issues examined in IOT&E conducted during FY87 were: capability to meet operational performance requirements, and capability to be an effective primary trainer. The suitability issues were: capability to effectively maintain and support the T-46A throughout its life cycle, and its availability at maturity.

OT&E ASSESSMENT

The flight of the first prototype T-46 aircraft (T-1) took place at Edwards AFB, California, on 15 October 1985. Because the program was cancelled, 19 months of operational test flying were concluded in March 1987 without fully examining all test objectives. During this period, IOT&E pilots flew 138 combined test sorties, logging 212.0 hours in the T-46. One hundred and seven of these sorties were flown in the two prototype aircraft (T-1 and T-2). These two aircraft were configured differently and were considerably heavier than the production aircraft. The remaining 31 sorties were flown in the first production aircraft (P-1).

During operational flight tests, which included 109 takeoffs and over 200 touch-and-goes, takeoff characteristics proved unsatisfactory because of heavy elevator stick forces and rapid change of stick forces required to capture the takeoff altitude. Landing characteristics were satisfactory and the aircraft fulfilled final approach speed and crosswind requirements. Airspace capability was unsatisfactory during 138 flights where pilots evaluated the T-46's capability to perform in the undergraduate pilot training airspace environment.

The aircraft could not perform sustained normal contact or formation maneuvering above 25,000 feet without an unacceptable loss of energy. The T-46 did demonstrate adequate performance to operate at altitudes below 25,000 feet within the lateral area limits established and in the traffic pattern.

Engine performance was unsatisfactory, while single engine characteristics were undetermined because test points were both very limited and simulated. During 212 hours of flight test, pilots evaluated the performance of the engines in a simulated training environment. They were satisfied with the simple starting procedures, fuel efficiency, and engine responsiveness; however, the following deficiencies would have had to be corrected for the aircraft to be used operationally: difficulty starting engines in a tail wind, manual mode start overtemperature, battery charger design, and engine rollback.

Divert range capability was unsatisfactory. The IOT&E team concluded from cross-country ferry data and other test performance data that the divert range of a production T-46 would fall far short of the 300 nautical mile single ship divert range requirement following a formation syllabus sortie. Simulations indicated the T-46 could, at best, divert 150 NM (no wind) following a syllabus formation mission.

The T-46's capability to perform the undergraduate pilot training syllabus maneuvers was marginal after pilots flew approximately 60 percent of the preplanned syllabus maneuvers in a variety of conditions and training scenarios. On most of the syllabus maneuvers, the T-46 demonstrated performance and handling qualities. However, on some maneuvers, the aircraft was consistently unsatisfactory.

Aircrew accommodations were marginal. The test-team pilots identified several deficiencies which detracted from the cockpit's utility and would be considered marginal in the operational environment. At test termination the following deficiencies still existed: the gear-down indicator lights were difficult to see, the circuit breaker panel was poorly located, the environmental control panel was difficult to see and use, visibility during formation flight was very limited, environmental control system (ECS) airflow in the production aircraft was too noisy and the curved stick grip limited lateral control.

Avionics performance was undetermined because at test termination, the evaluation was incomplete. The capability of the T-46 to serve as an effective primary trainer was left undetermined. The same was true of availability and reliability. However, several systems were deficient, and many of the identified system failures were classified as critical, including problems in landing gear and engine controls. Maintainability was unsatisfactory because uncorrected design deficiencies precluded safe and effective maintenance. Turn around times were satisfactory, with an average time of 5 minutes, 9 minutes better than the requirement of 14 minutes.

Because the program was cancelled while IOT&E was still underway, spin testing was not accomplished, preventing any evaluations. For the same reason, avionics performance could not be fully evaluated.

SUMMARY

Overall, the operational characteristics and capabilities of the T-46 proved unsatisfactory. Other test objectives (capability as a trainer, identification of potential hazards, availability, mission reliability, logistics reliability) remained undertermined or unrated at the time of test termination.

Maintainability was unsatisfactory because of task complexity problems with the engine control system and battery charger difficulties. System logistics supportability was found to be marginal because portions of the system design were too complex to be maintained entirely by personnel with typical skill levels.

GLOSSARY

GLOSSARY OF ACRONYMS

AFB	Air Force Base
AFEWES	Air Force Electronic Warfare Evaluation Center
AFOTEC	Air Force Operational Test and Evaluation Center
AGM	Air-to-Ground Missile
AIM	Air Intercept Missile
ASD	Assistant Secretary of Defense
ATF	Advanced Tactical Fighter
BES	Budget Estimate Submission
BIT	Built-In-Test
COMOPTEVFOR	Commander Operational Test and Evaluation Force (Navy)
CW	Chemical Warfare
CY	Calendar Year
C^3	Command, Control, Communications
DAB	Defense Acquisition Board
DDDR&E(T&E)	Deputy Director, Defense Research and Engineering (Test and Evaluation)
DoD	Department of Defense
DoDI	Department of Defense Instruction
DOT&E	Director, Operational Test and Evaluation
DRB	Defense Resources Board
DSARC	Defense Systems Acquisition Review Council
DT	Development Test
DT&E	Developmental Test and Evaluation
ECCM	Electronic Counter-Countermeasures
ECM	Electronic Countermeasures
EOA	Early Operational Assessment
EW	Electronic Warfare
EXCOM	Executive Committee on Air Defense Threat Simulators
F/A	Fighter/Attack
FOE	Follow-on Evaluation
FOT&E	Follow-on Operational Test and Evaluation
FY	Fiscal Year
FYDP	Five Year Defense Plan
GAO	General Accounting Office
ICBM	Intercontinental Ballistic Missile
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation

IPT	Initial Production Test
ITEA	International Test and Evaluation Association
JCHEM	Joint Chemical Warfare
JCS	Joint Chiefs of Staff
JTF	Joint Test Force
LOT	Limited Operational Test
LRIP	Low-Rate Initial Production
MCOTEA	Marine Corps Operational Test and Evaluation Activity
MEF	Mission Effectiveness Factor
MOT	Maturity Operational Test
MRTFB	Major Range and Test Facility Base
MS	Missile Seeker Radar
NATO	North Atlantic Treaty Organization
OA	Operational Assessment
OPEVAL	Operational Evaluation
OSD	Office of the Secretary of Defense
OT	Operational Test
OTA	Operational Test Agency
OT&E	Operational Test and Evaluation
OTEA	Operational Test and Evaluation Agency (Army)
OTO	Operational Test Organization (SDS)
OUE	Operational Utility Evaluation
PDM	Program Decision Memorandum
PE	Program Element
PMO	Program Management Office
POM	Program Objective Memorandum
RDT&E	Research, Development Test and Evaluation
SAC	Strategic Air Command
T&E	Test and Evaluation
TEMP	Test and Evaluation Master Plan
UHF	Ultra-High Frequency
VHF	Very-High Frequency